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THE SPATIAL PATTERN OF FARMING NEAR LAC LA BICHE, ALBERTA

by

© WILLIAM J. HOZACK

A THESIS

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FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "The Spatial Pattern of Farming Near Lac La Biche, Alberta", submitted by William J. Hozack in partial fulfilment of the requirements for the degree of Master of Arts.

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ABSTRACT

The focus of this study is the dimension of marginal farming in the Lac La Biche region of Alberta.

Farming conditions have been depressed, particularly in the past few years. Several factors contribute to this condition. The first is climate. There appears to be evidence that adverse weather conditions decrease the yield of crops. Widespread distribution of grey wooded soils which have a low natural fertility reduce farm incomes. Still another factor is lack of sufficient land and capital among a large proportion of the farmers which results in many farming operations being too small to be economically viable.

Generally the farm enterprises fall into three main categories. First, cash grain farms which are mainly located in the Venice - Hylo - Craigend area. The tradition of grain growing has remained as a remnant of early settlement days, as has the one and two quarter-section farms which are no longer economically viable. Many of these farmers require subsidiary off-farm employment because the returns from their farm operations are too small to provide an adequate level of living.

The second group live on poorer soils southeast of Lac La Biche. In general they have sufficiently large operations to return adequate incomes. Concentrating on mixed farming which emphasises cattle, these farmers do not appear to need off-farm income, and only work off the farm at jobs of opportunity. Several have large ranch type operations based on cattle leases on nearby crown land.

The third group located on the periphery of the study area, are called pioneer farmers for the purposes of this thesis. They have not progressed from the pioneer or homestead type of farming and are attempting to accumulate land and capital by settling in areas of heavy bush which can be purchased relatively cheaply. They do not have sufficient land, capital, or level of management necessary to become successful farmers.

Correlation and regression analyses are used to determine the factors responsible for success in farming. Relationships between gross farm income and various selected variables are tested for the study region as a whole and the sub-areas within it.

In summary, the criteria of successful farming in northeastern Alberta are farm size, cultivated acreage, and livestock enterprise as represented by numbers of cattle. Of itself, the study area is not wholly marginal, but contains areas of viable agriculture side by side with marginal areas. The difference between such areas is the type of farm economy pursued.

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Finally to my wife, Marj, my thanks and gratitude. The manuscript was written painfully slowly and almost entirely at home; only those who also have wives who simultaneously cope with small children and try to create regular quiet spells, can know the full extent of the debt I owe her.

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INTRODUCTION

This study is based on fourteen weeks of fieldwork in Northern Alberta during the months of June, July, August and September, 1968. Four weeks of this time were spent working in government offices in Edmonton, Lac La Biche and St. Paul.

The research project was undertaken as a sequel to a field-camp in the Lac La Biche region in the fall of 1967. During this camp the writer made a study of marginal farming in the area. As a result of this, and the continuous governmental and press concern with northern agricultural areas, the writer became deeply interested in the problems of farming in the northern areas of Canada. He has since gained the impression that there is no easy answer to the problems besetting these regions.

In this thesis the structure of farming in a part of the northern fringe of agriculture is examined in its spatial distribution, particularly the spatial distribution of low production, low income farms. While some land use orientation and description is unescapable, the study presents a spatial analysis upon which decisions could be based. The thesis is organized in three parts; the first consists of a discussion of methodology, in the second the physical adversity of the region in respect to agriculture, and the development of agriculture there is presented, while the third part consists of an assessment of current agriculture and a statistical analysis of data derived from fieldwork.

It is hoped that this thesis provides a more intimate understanding of the problems of marginal farming and rural poverty on a sub-regional basis on the northern margins of agriculture in Canada.

CHAPTER I

PURPOSE AND METHOD OF THE STUDY

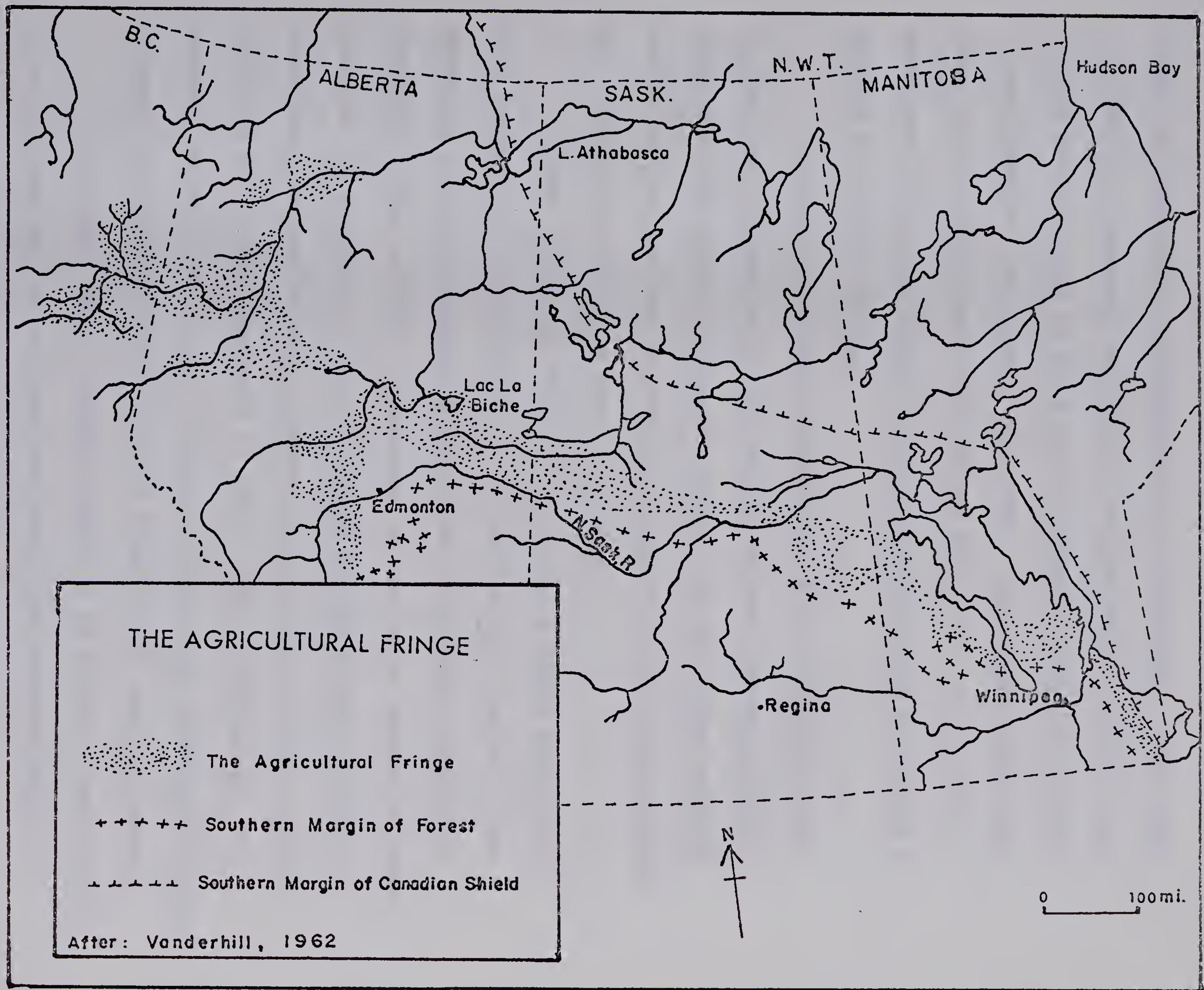
General Statements

The focus of this thesis is the spatial dimensions of marginal farming in the northern fringe of agriculture in Alberta. In this age as in every other age it has been a question how far men would go beyond the limits of successful settlement to reap advantages, what risks they would take, and what hardships they would endure. In some cases farmers stop short of the possible physical limits of occupation. In others, they have exceeded profitable limits and are holding out precariously and uneconomically in the face of drought, frost, poor soils, too great distances from market, and changing economic conditions (Bowman, 1931, p. 48).

In Western Canada today the agricultural frontier faces northward in a series of scattered patches and strips which form a belt stretching from Fort St John to Lake of the Woods (Fig. 1.1). Within this area every physical factor has a part to play in determining the boundary of land settlement and viable agriculture. Definite production techniques must be applied in response to the environment, and as a result, this is a region of continuing experimentation. As Bowman points out, pioneer belts are usually places of experiment, with settlement advancing and retreating on the outer fringe of land occupation (Bowman, 1931, v.).

The landscape on this northern fringe comprises a complex mixture of new homesteads and older established farmsteads in various

FIGURE 1.1



B.C.
ALBERTA
SASK.
N.W.T.
MANITOBA
Hudson Bay
L. Athabasca
Lac La Biche
Edmonton
N. Sask. R.
Regina
Winnipeg
N
0
100 mi.
THE AGRICULTURAL FRINGE
The Agricultural Fringe
Southern Margin of Forest
Southern Margin of Canadian Shield
After: Vanderhill, 1962

stages of development, reorganization or abandonment. Continuous adjustment is necessary and much of the distress in northern agriculture can be traced to the poor adjustment of unskilled farmers to poor physical conditions. As a result farm income levels are lower in the fringe region than in any other part of the Prairie Provinces. This area forms an economic region which has become a problem in the past decade.

To define an economic region is to draw a boundary around an area that is associated with certain economic characteristics. There are many kinds of economic regions, one type often overlaps another and collections of overlapping regions whose characteristics are interrelated form more general regions.

A type of farming region is an economic region specialized with reference to agriculture. It is delineated to include farms producing a fairly homogeneous collection of products, as well as transition areas in which the products of one region gradually become those of its neighbour. Types of farming regions usually have many underlying characteristics in common such as soils, climate, transportation or cultural phenomena to add to their cohesiveness. The northern agricultural fringe in Canada includes core areas specializing in wheat or livestock production with transitional areas in between.

In the same way a 'problem' region is an economic region which is as the name implies, an area that people are concerned about because it is not functioning well in terms of commonly accepted criteria. Since it is felt nationally that regional income disparities as great as those between the fringe region and other more prosperous

regions should be lessened, the fringe is an economic region that has become a problem region in the past decade. Thus, the northern agricultural fringe in which this thesis is chiefly interested is a problem area, particularly from the standpoint of economic development and agriculture.

The returns to human effort in farming, with few exceptions, are lower than for comparable effort elsewhere in the economy. Evidence suggests, however, that the incidence of low agricultural incomes is greater in northern regions than in the longer settled southern regions of the Prairies. This high incidence of low production farms is due to the special problems within agriculture, namely smaller acreages per capita of improved land, higher frequency of crop loss, and higher production and transportation costs. In combination these factors produce low-income groups and areas. Farms having these characteristics are classed in this study as marginal farms.

The Census of Canada does not specifically define a marginal farm. However, all farms reporting less than $2,500 gross income would be marginal in terms of the definition used here. Similarly many other farms in the lower income range of commercial farms would be marginal. Off-farm employment is considered to be an indicator of marginal farming. However, short term absenteeism does not necessarily indicate a marginal farm enterprise, it is more likely evidence of opportunity for limited complementary activity, for example trapping during the winter months. Long term absences are significant and there is usually an inverse relationship between low farm incomes and high

off-farm incomes.

The Agriculture and Rural Development Act 1965 defines a low income or marginal farm as one which earned less than $3,750 from the sale of farm commodities during the previous year. Using this definition, 59% of the resident farm operators in Northern Alberta had marginal enterprises in 1966. Their incomes were not high enough to allow them "to live according to normally acceptable Canadian standards, and not quite so low as to bring about starvation". (Canadian Assoc. for Adult Education, 1964, p. 1-2) (See Table 1.1)

Table 1.1

Farms in Alberta by Selected Income Categories

Farms	Total number in Alberta	Geographic distribution of farms in Alberta[1]			Percentage of resident farm operators		
		South	Central	North	South	Central	North
Selling $3750-4999	6,328	1309-22%	2900-45%	2119-33%	4%	14%	10%
	Poverty Line		A.R.D.A. 1965				
Selling $2500-3749	7,534	1349-19%	3331-44%	2854-37%	6%	11%	14%
Selling $50-2499	20,279	2969-15%	7922-39%	9388-46%	15%	27%	45%
Part-time operators	18,307	4371-25%	6865-37%	7071-38%	-	-	-

Source: Derived from data in 1966 Census of Agriculture

[1]South was taken as Census Divisions 1, 2, 3, 4, 5, 6, 9; Central - CD 7, 8, 10, 11; North - CD 12, 13, 14, 15.

Table 1.1 and Fig. 1.2 show a progressive increase in the number of marginal farms from south to north in Alberta. Over 12,000 of the 28,000 farmers in Alberta who sold less than $3,750 in 1966 were located in northern Alberta. In addition, this region contained almost 40% of the part-time farms in the province. Within this large northern area there seems despite the existence of a few dissenters to be agreement among economists, geographers, and sociologists that agriculture contributes little to regional economic growth.

Review of Literature

Geographers generally have given the spatial dimensions of rural poverty scant attention. Most work has been land use oriented and descriptive, and analyses upon which public decisions could be made have been virtually neglected.

On the other hand economists have recognized the unique qualities of rural poverty and have developed numbers of theories to cope with the pathology of economic growth. Two groups of theories or hypotheses, settlement hypotheses and the location-matrix hypotheses have largely preoccupied economists.

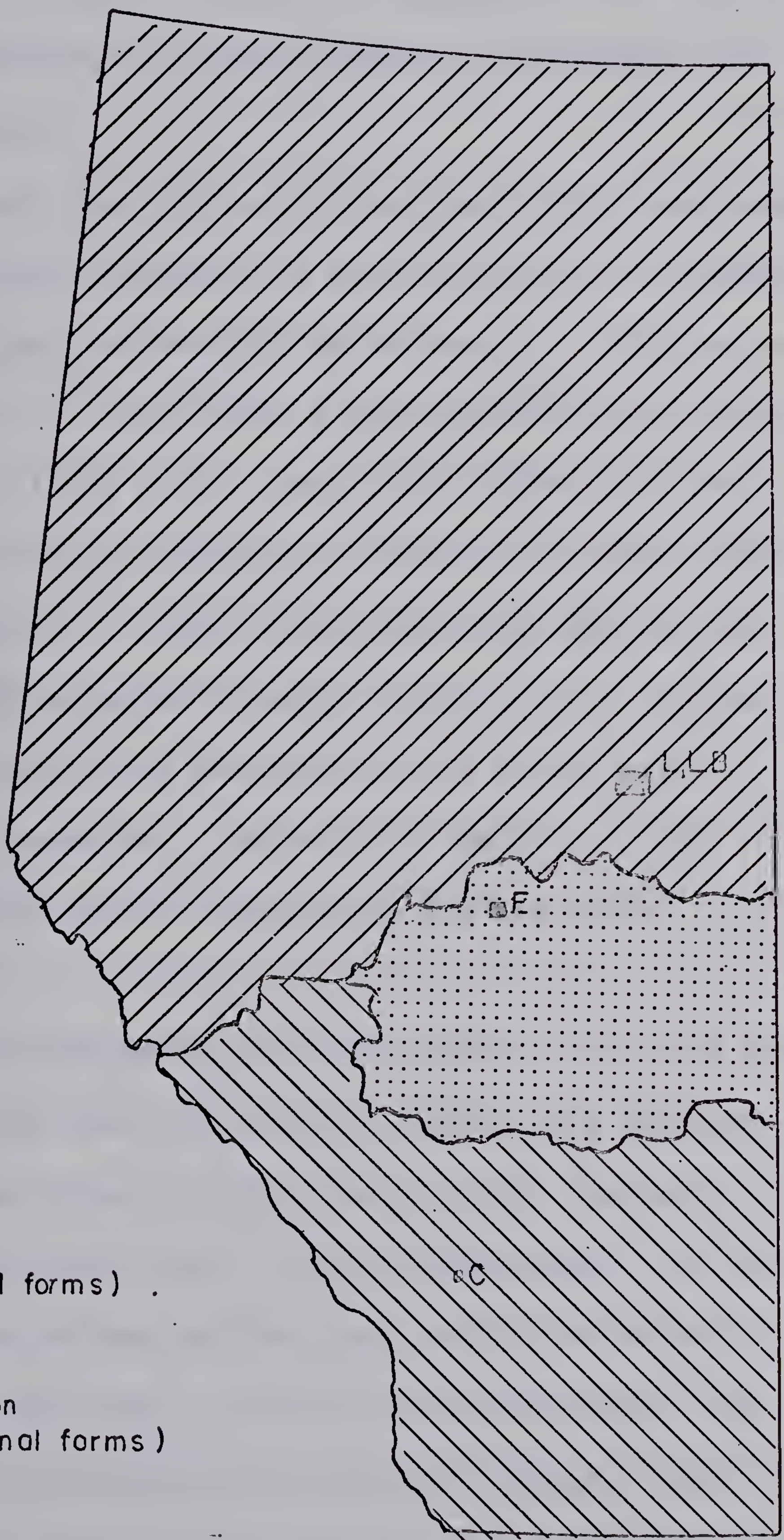
Settlement Hypotheses

History offers some clues why incomes in certain areas have lagged behind over lengthy periods. In the United States for example Caudill has pointed out the effects of the ways in which the country was settled. He recognizes settlement waves (Caudill, 1965, pp. 3-9). At the forefront were the frontiersmen who were trappers, hunters, traders and adventurers. Following them were scratch-farmers who built crude cabins, cleared land and ploughed the earth. They had

DISTRIBUTION OF MARGINAL FARMING IN ALBERTA

INCOMES LESS THAN $ 3,750

FIGURE 1.2



—Southern Region
(21 % morginal forms)

— Central Region
(38 % morginal forms)

— Northern Region
(59 % morginol farms)

Source: Table 1.1

no real attachment for the land however, and tended to move to a new frontier after the land began to loose its productivity. The third wave was comprised of farmers who formed permanent settlements and had long-term perspective.

However, at every stage of the scramble westward, some groups of frontiersmen and pioneer farmers were engulfed by the third wave. "Out of tune with the dominant society and culture .... the frontiersmen and scratch-farmer .... fell behind a generation or two in their own lifetime" (Caudill, 1965, p. 4). The author states that they " .... were largely unschooled. They were addicted to direct action and simplicity of thought, ... they were magnificent specialists, but their speciality had vanished" (Caudill, 1965, p. 4). He goes on to state that the heirs of the marooned culture tended to fall farther behind their compatriots. According to Caudill, "This subculture is predominant today in Appalachia and the Ozarks ...." (Caudill, 1965, p. 54).

Galbraith again discussing the United States, cites the settlement pattern, the way the land was initially divided and occupied, as the factor which gave rise to a whole set of rural complexes inimical to growth (Galbraith, 1956). Early homesteaders, and sometimes the laws under which they settled, gave too little attention to the productivity of the land, to climate, and topography. The result was oversettlement as economic conditions changed, which in turn led to underemployment, low production farms and low income.

A third settlement hypothesis is that the more educated, progressive and vigorous pioneers settled in what today are the

commercial farming areas. (Lewis, 1957). Another class of settlers who lacked education and capital, were unable to compete with other pioneers for better lands, and were forced by economic realities to settle on lands of lower productivity which today are the low income rural areas. The inertia of initial lack of physical assets and education continued to provide a barrier to economic progress, and the income level continued to lag behind that in other areas.

Several studies have tested the ability of these settlement hypotheses to explain current poverty. Nicholls' analysis of the Upper Tennesse Valley tends to support such hypotheses. He found that ".... today's more industrial counties have historically had somewhat superior 'original' natural resources for financing education" (Nicholls, 1957, p. 313). The currently more industrialized counties appear to have had no economic advantage over other counties up to 1900 due to stagnation following the Civil War.

Financial support of schools in the 1850-1920 period was closely related to wealth in agriculture which was greater in what are today the more industrialized counties. Nicholls concluded that basic differences in cultural attitudes and agricultural wealth among counties resulted in industrial development rather than vice versa (Nicholls, 1957, p. 314). This finding, that development and economic growth stemmed from basic initial differences among counties, is generally consistent with the settlement pattern theory of growth.

Booth's study of eastern Oklahoma shows that the current income pattern is directly correlated with initial farm settlement

[illegible]

[illegible]

[illegible]

[illegible]

patterns (Booth 1961). Early farms were too small and white settlers were interlopers in Indian territory for a number of years. Many of the settlers were from the Southeast and Appalachian areas, with less interest in education than persons from the Midwest who more frequently settled in western Oklahoma.

Although numerous examples can be cited to support settlement hypotheses in their explanation of rural poverty, others can be cited to indicate that currently poor areas were not always so. Tang's analysis of the Southern Piedmont demonstrated that current differences among counties could not be explained by differences in settlement patterns or land quality (Tang, 1958). The settlement pattern explanation of rural poverty applies in a sufficient number of cases to justify its usefulness. However, there are so many exceptions not explained by settlement patterns that it is necessary to look for another more general explanation.

Location-matrix Hypothesis

T.W. Schultz states that differences in level of living are basically the consequence of the way the economy of the country develops, and are not primarily the result of original differences in cultural values, capabilities of people, or man-land ratios (Schultz, 1953, p. 157). Low income areas, once nearly at the same economic level as areas that are now developed and prosperous, did not progress economically as fast because resource mobility was hindered by a disadvantaged position in the location matrix. Schultz argues that economic development occurs in a specific location matrix which is primarily urban-industrial at the core. Factor markets and

forces of economic development function best near the core (Schultz, 1953, p. 147).

The urban oriented pattern of agricultural activity is thus clear, and findings consistent with those mentioned above abound. One study shows how the average value of land and buildings per acre decreases and average size of farms increases in the northeast U.S.A. as the level of local urbanization decreases, distance from metropolitan centres increases and the size of related centres decrease (North, 1964). These agricultural activities located on the periphery of urban systems enjoy progressively poorer and less efficient factor and product markets than those more favourably placed towards the centre.

None of these findings should really be a surprise. They are accounted for logically by the classic theory of agricultural location in the tradition established by Von Thünen and since elaborated on by many location theorists and regional scientists.

Several studies have tested Shultz's location-matrix hypothesis. Tang found substantial support for it in the Southern Piedmont; Booth rejected the hypothesis in its application to eastern Oklahoma (Tang, 1958, Booth, 1961). Diehl found no support for the hypothesis based on cross-sectional data for the Southeast United States between 1950 and 1960 (Diehl, 1966).

The location-matrix hypothesis has been widely accepted. However, as Tweetan points out it is not supported by complete empirical evidence simply because it is only a partial theory. It is overshadowed by other important forces in the many instances

where data do not support it (Tweetan, 1968, p. 12).

In place of the location-matrix hypothesis Tweetan presents a theory of economic stagnation which contains three basic elements that apply to individuals, regions, or groups (Tweetan, 1968, p. 13). Stated briefly they are (a) the subjects are confronted by factors which require adjustments in resources, products and technology, (b) the subjects have identifiable characteristics which give rise to differences in ability to adjust to factors in (a), and (b) when the forces requiring adjustments are large relative to the ability to adjust a threshold level of adjustment is reached after which the area environment becomes less rather than more conducive to to satisfactory economic adjustments to changing conditions.

The Poverty Problem in Canada

In Canada it has been suggested that a major reason for the lack of recognition of the extent and severity of the problems of rural life has been the publicity given to technological and productivity advances in agriculture which have effectively masked the reality that not all farmers were affluent in urban terms (Menzies, 1965, p. 2). Menzies condensed the findings of the Eastern Canada Farm Survey 1963 into ten observations which highlighted the increasing redundancy of small farmers most of whom actually are part-time farmers and have uneconomic sized farms. The Survey defined farms with an income of less than $2,500 as "non-viable" or uneconomic enterprises. Farms with cash sales between $2,500-$4,999 were defined as "viable", or having a fair chance of becoming and surviving as economic enterprises. Farms with sales totalling more than

$5,200 were defined as "economic".

In his study of life and poverty in the Maritime Provinces, Pepin concluded that rural poverty and marginal farming are the result of a malfunctioning of the economy and of a deficient development of a territory (Pepin, 1968, p. 2). However, in his investigation of marginal farming and its problems in Quebec, Biays attributed the main causes to human and physical factors (Biays, 1968, p. 268).

Three studies, one by Berry (1965) and two by Szabo (1965 and 1966) established new levels for rural research emphasising computer techniques to overcome problems of scale and scope of the subject. Berry's studies identify areas of rural poverty by concentrating on income, farm capital and education by using factor analytic techniques. Szabo on the other hand analyses resource productivity differences in areas which have a persistent population loss. He utilizes a step-wise multiple regression and measures the marginal returns in dollar terms for areal units in different soil zones. His work which has been subsequently used by economists for farm income analyses is fundamental to rural problem analysis and planning.

On the local level a general statistical survey by W.M. Schultz in 1966 of Census Division 12 has very little sub regional analysis and relies heavily on Census data.

A report by Campbell (1966) on inter-regional comparison of comparative resource advantage, and an M.Sc. thesis by Ross (1967) on degrees of success of homestead settlement use modern computer techniques to assess rural areas with a view to making recommendations upon which public decision making may be based.

Objectives and Framework of the Present Study

The overall objective of the present study is to measure the spatial dimensions of marginal farming in one part of the northern agricultural area of Alberta.

Specific objectives are:

(1) To indicate how the present distribution of resources among farmers affects the spatial variations in farming opportunities. To compare resource utilization both within areas and between areas. This will be shown by:

   (a) the proportion of farms which are non viable

   (b) the structural limitations on potential productivity

(2) To measure the amount of marginal farming that actually exists within the region. This will be done by analysing various mixes of the following variables; land, crops, livestock, farm and non farm income.

(3) To determine the factors associated with low production or marginal farms by looking at farm structure, organization and technology. Well structured farms have ample amounts of land and capital to permit income parity with urban areas. This in fact should determine some of the problems confronting farmers in northern areas.

(4) To investigate some of the possible adjustments which might be usefully applied to farming in these regions.

Criteria for Selection of the Study Area

The northern fringe of agriculture in Alberta has lost any comparative advantage it may once have had relative to the overall farming economy in the province. At the present time it is a depressed farming region.

It has been contended that the initial exploitation of this region was profitable, again relative to the overall economy (Campbell, 1966, Petersen, 1968). However, Mackintosh and Murchie oppose this point of view with well documented evidence that the agricultural frontier never was based on a sound economic footing. (Mackintosh, 1936, Murchie, 1936). The frontier is always a place of economic stress.

Whichever viewpoint is accepted, the changing character of the economy in recent years plus the development of new technology both within and outside agriculture soon altered any comparative advantage the area may have possessed. In the face of changing conditions within the farm industry generally and reinforced by unfavourable physical conditions, farm consolidation was necessary in Alberta to establish economic farming units. In such places as the northern fringe where consolidation has generally not taken place, low production marginal farms will predominate.

Areas of low farm productivity and income are characterized by an economic organization which is deficient. This deficiency arises from the maladjustment of soils, farm size, organization and technology to the new standards of farming. These sets of farm resources define the potential or limits of productivity of a region.

The Study Area

As it was considered impossible to research the whole of the northern agricultural fringe adequately a sample area was selected which was considered representative of this fringe. The Lac La Biche region in northeastern Alberta was chosen. This is an area whose problems have received government and press attention over the past three years.

A geography field camp held in the Lac La Biche area during the fall of 1967 provided a preliminary overview of the area and its problems. This presented the opportunity to become acquainted not only with the area, but also with government officials and farmers and assess their opinions.

As a result of an evaluation based on a synthesis of personal experience, opinions of residents in the area and several reports (Spence, 1967, McCann, 1967, Hozack, 1967), the Lac La Biche region was judged to be adequately representative of the problem areas of the northern fringe of agriculture.

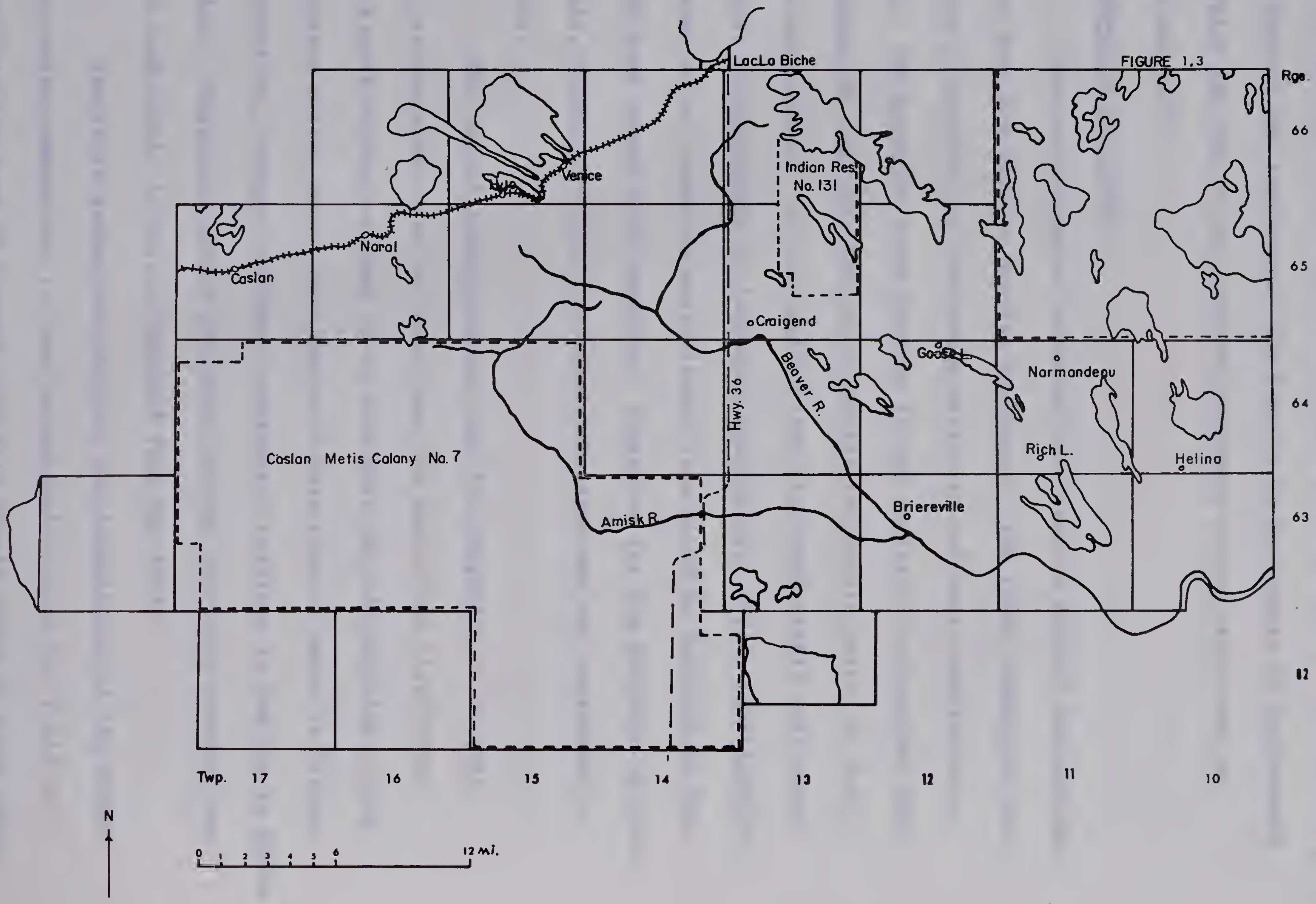
Location

The Lac La Biche study area is located approximately 140 miles northeast of Edmonton, Alberta, and is synonymous with the southern half of Improvement District 102 (Fig. 3). Lying between the 16½ and 17½ base lines, the study area is made up of townships 63 to 66 and ranges 10 to 17 west of the 4th meridian.

The area therefore is approximately a rectangle 24 miles north to south and 48 miles east to west. It fits into the West Canadian survey grid and encloses an area of 844,800 acres. The focal point

LAC LA BICHE STUDY AREA

FIGURE 1.3



of this area is the town of Lac La Biche sited on the southern shore of the lake of the same name. The town is in the centre of Improvement District 102 and on the northern periphery of the study area at 56^{o}N and 112^{o}W.

Approach to the Study

The methodological approach was based on several assumptions which gave the study a special structure. The first assumption was partly a rejection of the Census definition of what constitutes a farm. The question arose whether it was realistic to consider that holdings of less than 160 acres constituted viable units for full time agriculture. It was decided that they were viable only under special circumstances of intensive agriculture. Upon investigation no special or intensive agricultural type could be detected in the study area except mink ranching. Therefore for the purposes of this thesis, anyone who owned less than 160 acres was not considered a farmer.

The second assumption was that the character of an area such as the study area is based upon the people who live there. The simple holding of land in an area does not add anything to the character of the area. An example of this type of owner is Dignam Corporation, Toronto, who have substantial holdings in the Lac La Biche region. Therefore, owners who lived outside the study area but who held land within it were eliminated from the study.

The third assumption was that the inhabitants of the Beaver Lake Indian Reserve No. 131 and Caslan Metis Colony No. 7 did not constitute the type of farmers that this thesis hoped to focus upon.

They receive government aids and are not involved in the free enterprise system in the same fashion as ordinary farmers. Therefore, these two areas were eliminated from the study. Because of the cultural barrier effect of the Metis colony on the three townships southwest of the colony which are uninhabited, the study area was again reduced leaving just over half a million acres (526,080 acres).

Two weeks were spent searching the tax rolls in the Department of Municipal Affairs to obtain the owners of all land in the study area. From this list all owners of less than 160 acres, and those who lived outside the area were eliminated. This gave the total research population of land owners in the Lac La Biche area.

The next step was to consult the Post Office guide to the area and list those people owning 160 acres or more who gave their occupation as "farmer". The total number of "farmers" was found to be 290. Using random numbers, 100 names were selected for interview. An additional 50 names were also selected in case any of the original sample were unavailable or refused to be questioned.

Field Research

The first two weeks in the field were spent testing and redesigning the questionnaire for the interview.(Appendix I) and in posting letters to the farmers explaining that the writer would be calling over a period of two months seeking information.

The questionnaire was conducted by personal interview. Farmers were called on every week day Monday through Saturday. It was found that Sunday could be better spent surveying the area. Although 30 farmers were unavailable for interview for various reasons,

the remainder allowed themselves to be questioned without any difficulty. Possibly some farm background on the part of the writer helped in this, and in guiding the course of the interview. However, as a result of the ease with which the field survey went, it was decided to interview all the people selected by the random numbers, and 120 farmers were eventually interviewed. Of this number, 23 were eventually rejected mainly because of inadequate information on income leaving 97.

Appraisal

Answers to all questions within the questionnaire were adequate for the purpose of analysis, and no significant aspect of the intended study was missed. However, in view of the fact that it was intended to use computer techniques for analysing the data obtained, the questionnaire was poorly structured for easy coding and considerable time had to be spent on re-organizing the data in it.

There is no doubt that the personal interview type of questionnaire yielded both data and insight which would not have been obtained using a postal questionnaire. Several French-Canadian farmers readily admitted that they would not have answered a postal questionnaire, while some farmers of Italian descent could not read English. As regards the French Canadians, an effort to speak French generally resulted in the conversation continuing in English -- but the effort had to be made.

A problem encountered with the questionnaire was that it yielded a plethora of data far in excess of what was required for this thesis.

CHAPTER II

PHYSICAL LIMITATIONS FOR AGRICULTURE

From the physical standpoint three factors, climate, relief, and soils govern all agricultural activity. At Lac La Biche on the southern margin of the boreal forest, their influence is more intense and the restrictions imposed by them are more severe than in more favoured regions further south. The restrictions limit the number of crops that can be economically grown in northern areas. Crops best suited for these regions are those that are hardy and fast maturing such as forage crops and hay, thus reducing the frost hazard. Grain crops can be grown if the weather permits, and indeed the long-term statistics show that the region has as good or even better yields than anywhere else in Alberta (Alberta, Dept. of Agriculture, 1959). These yield statistics say nothing about grades, and indeed the region is climatically marginal for grains, especially wheat. Unfortunately when the economic incentives pull, grain growing will be attempted, and this provides the stuff of which marginal farms are made. The principal reason why the effects of weather are not fully reflected in existing yield data stems from the fact that in bad years more than normal amounts of the planted acreage are abandoned, and that the yield is calculated on the basis of harvested acreage (Schultz, T.W., 1953, p. 196). The failures are never counted.

This chapter focusses on the physical aspects of the study region, and is concerned with the limiting function which they exert

on agriculture. Because there is an interrelationship between marginal farming and cash grain growing, and because it is felt that the importance of the physical limitations especially that of climate for farming in these northern regions has never been discussed fully, this chapter examines the hazards and limitations in some depth.

Climate

Climate is the primary influence upon an area's suitability for agriculture (Higbee, 1958, p.17). To a certain extent soils can be improved if they can be cultivated. The farmer is often severely handicapped by the limitations of climate and the daily vagaries of weather. One of the basic features of agriculture is that it is an outdoor occupation and thus subject to all the vicissitudes of weather which may one year combine to produce a bumper harvest and the next year, by drought, flood, hail, or unseasonable frost, usher in disaster (Higbee, 1958, p.17).

The climate of the Lac La Biche area is boreal, characterized by long severe winters and short, pleasantly warm summers. A mean annual rainfall of 17.8 inches with a summer concentration, and a mean July temperature of 62.3°F produces a relatively high precipitation efficiency (McCann, 1967, p.10) (Table 2.1).

In favourable years this combination of rainfall and temperature can lead to good crop yields provided that soil drainage and fertility are also favourable and proper land management techniques are employed.

The mean temperatures at Lac La Biche are as follows (Table 2.2).

Table 2.1

Mean Monthly and Annual Temperature and Precipitation Data[1] for Lac La Biche (1,835 ft elevation).

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°F)	1.4	6.7	18.1	36.2	50.1	57.4	62.3	59.5	50.0	39.4	21.2	8.5	34.2
Precipitation (ins)	1.03	.94	.87	1.02	1.36	2.64	2.83	2.74	1.80	.78	.97	1.05	17.83

Source: Extracted from Temperature Normals for Alberta, Climatic Data Sheet 9-64, Dec, 1964 and Precipitation Normals for Alberta, CDS 5-65, May 1965, Climatology Div., Met. Br. Canada, Dept. of Transport.

Table 2.2

Monthly and Annual Temperatures °F for Lac La Biche.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Mean daily	1.4	6.7	18.1	36.2	50.1	57.4	62.3	59.5	50.0	39.4	21.2	8.5	34.2
Mean daily Max	9.6	16.3	27.9	46.6	61.3	67.7	72.7	69.7	59.4	48.3	28.4	16.7	43.7
Mean daily Min	-6.8	-2.9	8.3	25.8	38.9	47.1	51.9	49.5	40.6	30.5	14.0	0.3	24.7

Source: Temperature Normals for Alberta, CDS 9-64, Dec,1964, Climatology Dov., Met. Br. Canada, Dept. of Transport. p. 5. Data from 10 year period 1951-60 adjusted to standard normal period 1931-60.

[1] Temperature figures are for the ten year period 1951-60 adjusted to the standard normal 1931-60 by Climatology Div., Met. Br., Canada, Dept. of Transport, as published in Temperature Normals for Alberta, CDS 9-64, Dec, 1964, Precipitation figures based on period 1931-60, no adjustment factor being used.

Using mean daily temperatures five months have average temperatures of 50° F or above. Applying mean daily maximum temperatures the same five months equal or exceed 50° F. However, using mean minimum temperatures only July has an average temperature over 50° F. Therefore summers are short but they may be hot, and springs and autumns brief. Winters are long and bitterly cold. Extreme variability of temperatures during the winter months is due to intrusions of warm chinooks into the region and warm Pacific air from the south.

Agriculturally the greatest limitation is the risk of frost during the growing season. With the possible exception of the month of July, summer frosts can occur at any time during the growing season. Specially vulnerable periods for small grains are late May and early June when the grain is sprouting, and August when the heads are filling. For most crops warmth is below optimum even though decreasing altitude towards the northeast of Alberta compensates in part for increase in latitude (Carder, 1965, p.20). Studies by Carder and others from the Beaverlodge Agricultural Research Station show that aside from elevation nearness of large rivers and lakes can induce considerable climatic amelioration (Canda, Dept. of Agriculture 1964, Research Rept. 1958-61, Exptl. Farm, Beaverlodge, Alberta). Longley also reports that surplus water counteracts the effect of topography on frosts, " .... thus observing points near large lakes, i.e. Cold Lake, Lac La Biche, and Wagner, have longer growing seasons than land away from the Lake" (Longley, 1967, p.24). The amelioration of climate brought about by the numerous lakes and water bodies in the study area makes possible earlier growth of crops around the

lakes in the southeast part of the region.

Frost Free Period

At least two critical temperatures require consideration to determine the suitability of a region for agriculture (Currie, 1959, p. 2).

(1) The temperature at which growth begins in spring and ceases in fall.

(2) The temperature at which either chilling or freezing noticeably reduces the economic return from plants.

While no one set of temperature values is equally applicable to all plants, certain values are considered to be essential for growth. Plants require suitable temperature conditions in order that germination and growth take place. Low temperatures permit only slow growth, the minimum for wheat and barley being about 40° - 42° F. For this reason the dates in spring and fall corresponding to a mean temperature of 42° F are often used by farmers as the start and end of the growing season.

The frost-free season is taken as the period between the average date in late spring and the average date in early autumn when the temperature is always above 32° F (Currie, 1959, p. 3). However, it is considered that the killing frost free period, basis 28° F places a more stringent and, therefore, more vital limit on the growth of cool season crops than does the frost-free period. Unless occurring at the crucial times of sprouting and filling, frost may do little or no damage to cool season crops, although a killing frost of 28° F or below almost invariably results in damage which may be

total.

In general, the shortness of the frost free season constitutes the most important climatic limitation, and the most serious hazard to cultivated plants (Currie, 159, p.1). When the mean minimum temperature is rising slowly in the spring or falling slowly in the fall, a change of 1° F is reflected by a significant change in the frost-free period (Longley, 1967, p. 247). Longley and Louis-Byne 1966, in making a study of the Springdale district of Alberta, found a decrease in temperature of 3.6° F in the vicinity of muskeg areas. The Springdale area is one of till ridges, valleys and muskegs not unlike the Lac La Biche area. They concluded that many of these areas would seldom go a month without experiencing freezing temperatures (Longley and Louis-Byne, 1967, p. 14). It is therefore possible that many areas exist throughout the Lac La Biche region where due to favourable or unfavourable microclimatic factors the seasons are either lengthened or shortened for agriculture.

Mean spring and fall frost dates according to Longley, Currie and Chapman are shown on maps 1-6 using 32° F as the basis (Longley, 1968, Currie, 1959 and Chapman, 1966). Each author used different data; Longley in attempting to show climatic change used 1950-64 statistics and compared them with the standard normal period 1931-60, Currie used pre 1950 data, and Chapman used the standard normal period data 1931-60[2]. Thus the mean number of days free from frost

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[2]The frost free period 1950-64 studied by Longley is a very short one with which to make predictions. A general lengthening of the frost free period by as many as 19 days was observed in the Athabasca River basin. However, many climatological studies show that mean temperatures vary in cycles from a decade to a century. No one is agreed on the cause, but the increase could prove significant in marginal areas where a 90 day growing period is required.

FIGURE 2.1

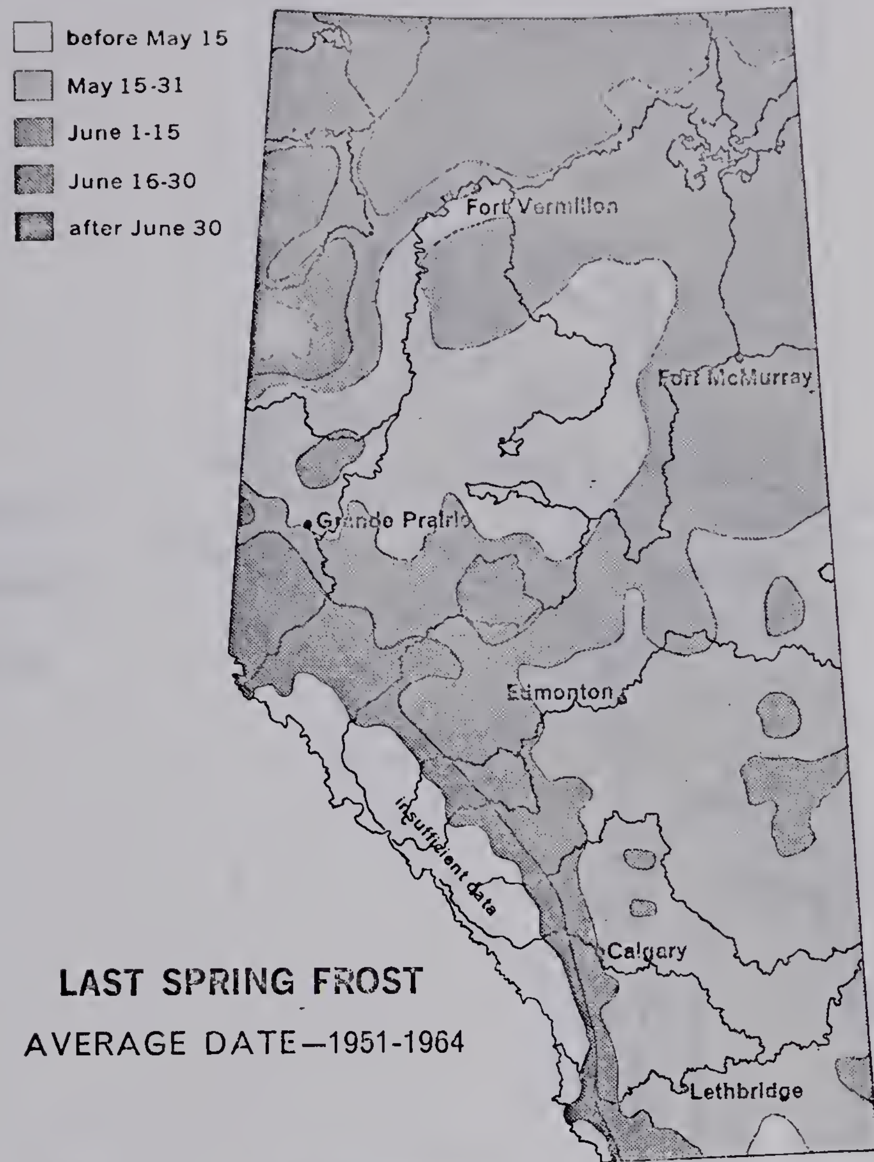
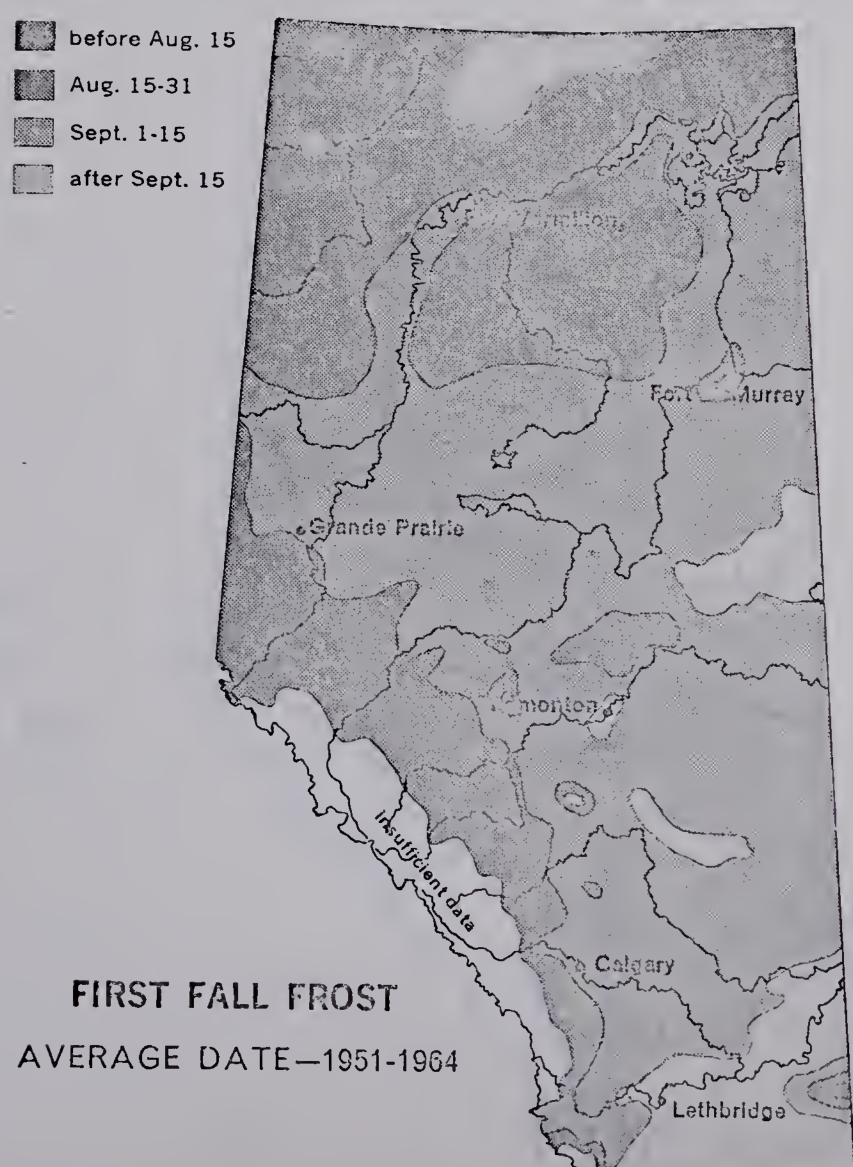


FIGURE 2.2



Source : Longley, 1968.

FIGURE 2.3

Isolines for median number of days from the beginning of the year to the last day in spring with frost.

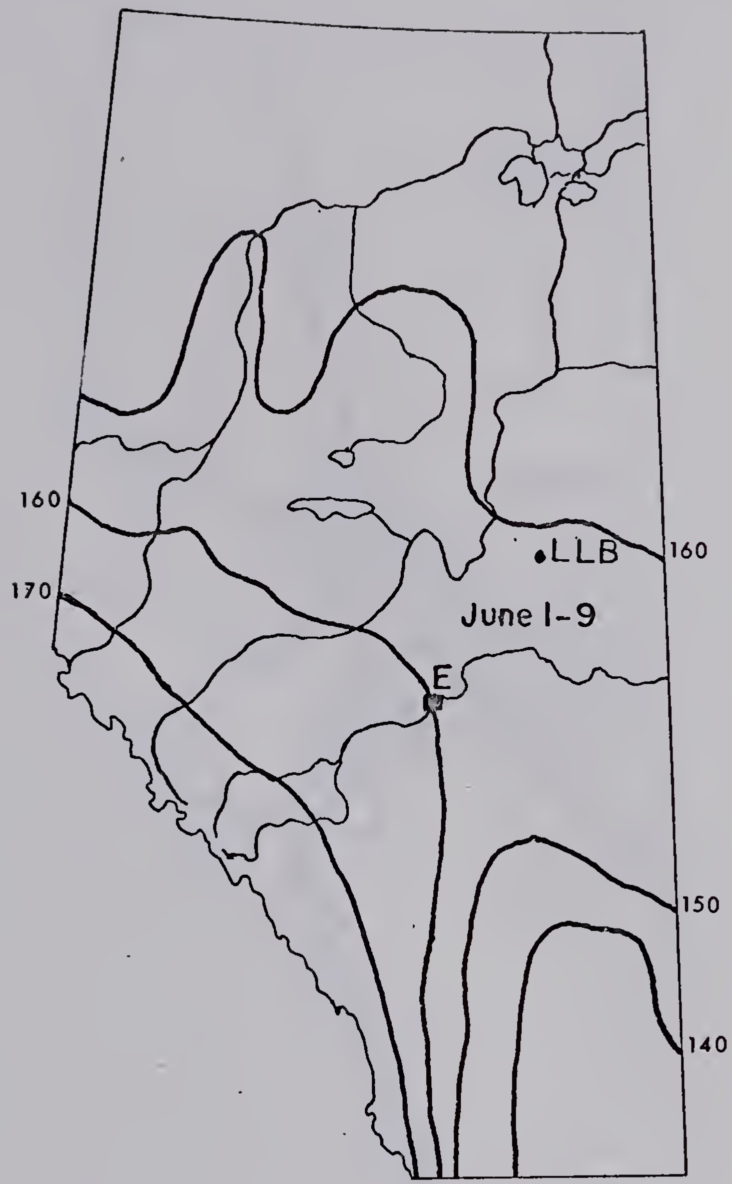
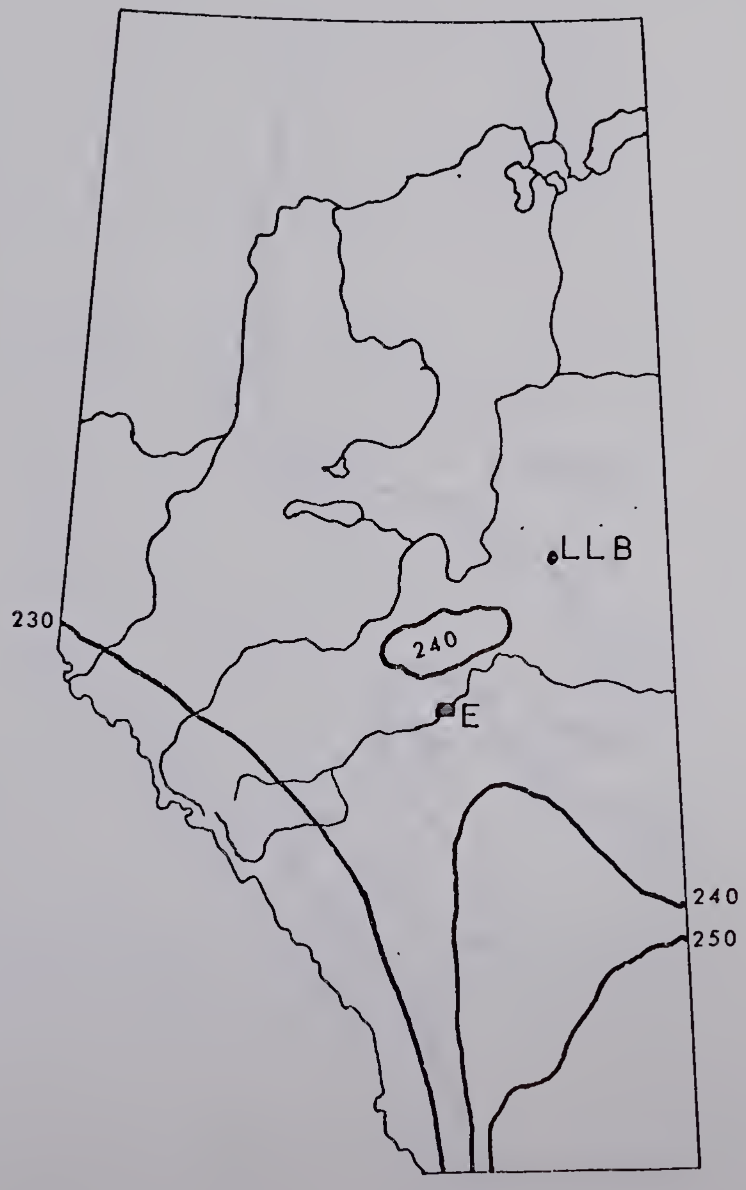


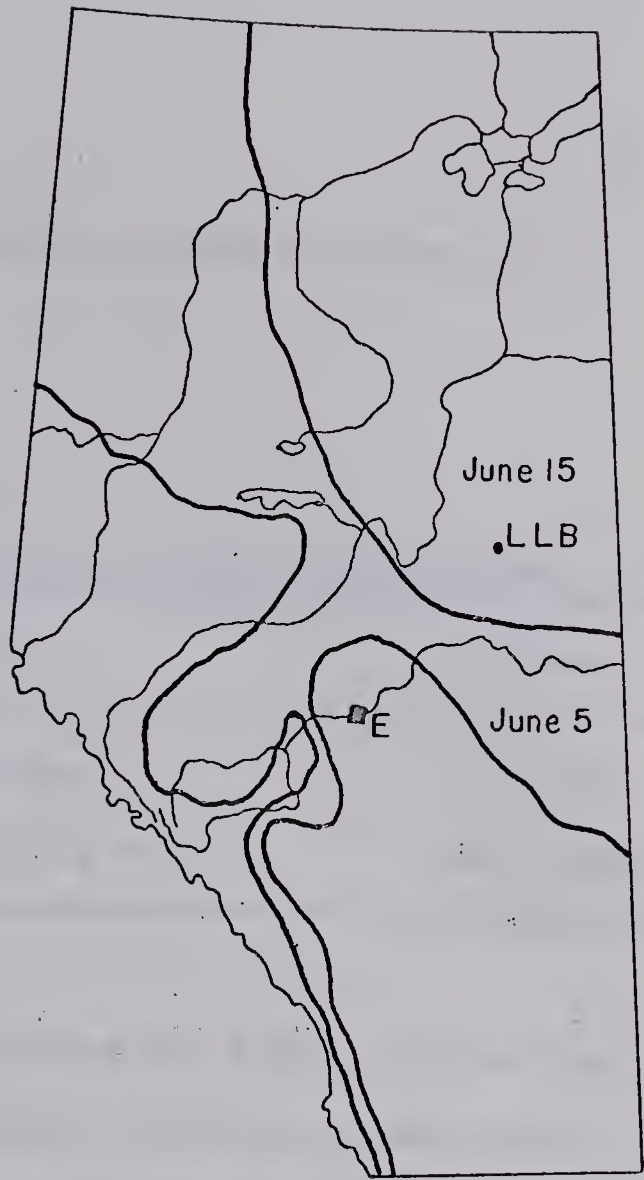
FIGURE 2.4

Isolines for median number of days from beginning of the year to the first day in fall with frost.



Source : Currie 1959.

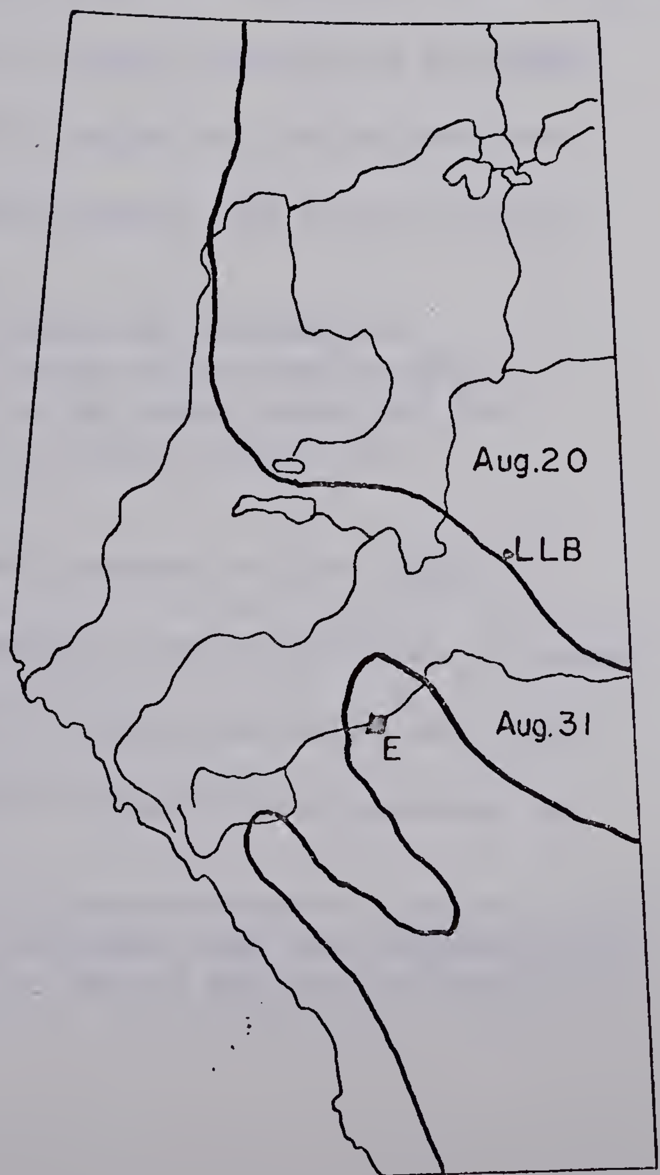
FIGURE 2.5



Last Spring Frost

Average date 1931 - 1960.

FIGURE 2.6



Last Fall Frost

Average date 1931 - 1960.

Source : Chapman 1966.

at their most extended dates around Lac La Biche vary from 77 to 107 (Table 2.3).

Table 2.3

Mean Number of Frost Free Days According to Three Meteorologists.

Longley	Currie	Chapman
107 days	89 days	77 days
June 1-Sept 15	June 1-Aug 28	June 15-Aug 31

Longley and Currie agree regarding the average date of the last spring frost whereas Chapman places it about two weeks later. The first frost in autumn should occur between the 28th - 31st August according to Currie and Chapman with Longley placing it two weeks later for the 1950-64 period. Both Longley and Currie note the extreme variability of the frost free season, and Currie states:

> "..... exceptionally long frost free periods are possible since the earlier dates of the late frosts may occur in the same year as the later dates for the early frosts. The converse situation could also occur .... "

The first fall frost for 1968 occurred on the nights of August 12-13 when the writer was camped on the north shore of Beaver Lake[3]. Frost continued intermittently across the study area until August 25, and then continuously until research was completed on

[3] The intensity of the frost was such that the windshield of the car required scraping at 8:30 a.m. on the morning of August 13.

September 7. The results of these frosts were quite widespread and visible within a few days. Frosted grain could be distinguished by its light green colour against the background of ripening grain in approximately two out of every three fields.

For cool season grain crops the use of the 28^{o} F killing frost temperature would give an extended frost free period and more probability of escaping killing frost in June, July and August. However, when describing climate the average dates of the last spring and first autumn frosts and the average number of frost free days are given. Frost is usually based on the occurrence of a temperature of 32^{o} F or lower in a Stevenson screen 4½ feet above ground. A later date for the first killing frost based on 28^{o} F in autumn for example would be preferable for grain crops. On the other hand the screen method using the average date gives a 50% chance of avoiding frost damage (Chapman, 1966, p. 8). For better odds one would point to an earlier date in fall. In addition, when the temperature at the screen is 32^{o} F, the temperature at ground level and among the crop is lower, in some cases close to 28^{o} F. These factors tend to balance each other, so the average date based on 32^{o} F seems valid.

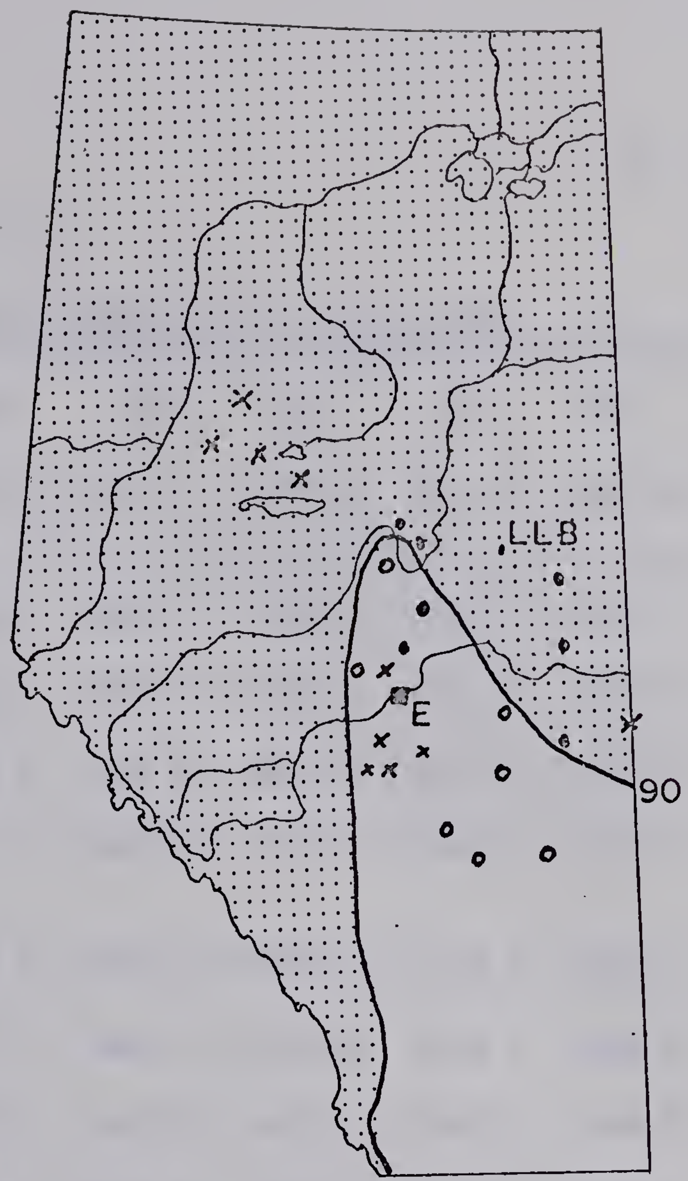
Over forty years ago W.G. Reed wrote, though with specific reference to the United States, ".... There is very little agriculture, except that based upon wild hay and grazing, where the average season between killing frosts is less than 90 days"(Reed, 1916, p. 509). By killing frosts Reed meant 32^{o} F.

If the criterion of 90 days free from frost is accepted to bring a crop to maturity (and over most of the grain lands of the

Prairies this is the criterion), the Lac La Biche region lies in an area of climatic hazard (Bennett, 1959, p. 43) (Fig. 2.7). One station close to the study area at Iron River was assessed as having only 75 days free from frost. However, when the distribution of land under agriculture in Alberta is considered in relation to the isoline of 90 frost free days, the Lac La Biche area becomes a part (albeit on the northern margin) of an accepted grain growing area (Fig. 2.8).

Undoubtedly the area is one of climatic hazard for farming even though a wide range of crops and agricultural products is grown. Because it is impossible to predict what the weather will be during a coming season, the planting of a grain crop is somewhat of a gamble. Therefore the percentage risks of frost in spring and autumn for Melfort Sask., similar in situation and climate to Lac La Biche are presented in Tables 2.4 and 2.5. After June 4th there is less than a 50 per cent chance of the temperature being less than 32° F (Table 2.4). Similarly in autumn the chance of 32° F or less increases from 50 per cent after September 8th (Table 2.5). From these calculated figures, it is evident that Longley, Currie and Chapman have bracketed the dates of the latest spring and earliest fall frosts very closely indeed with an error of plus or minus one week.

FIGURE 2.7



Isoline of 90 Frost Free Days

Under 90 F.F. days.

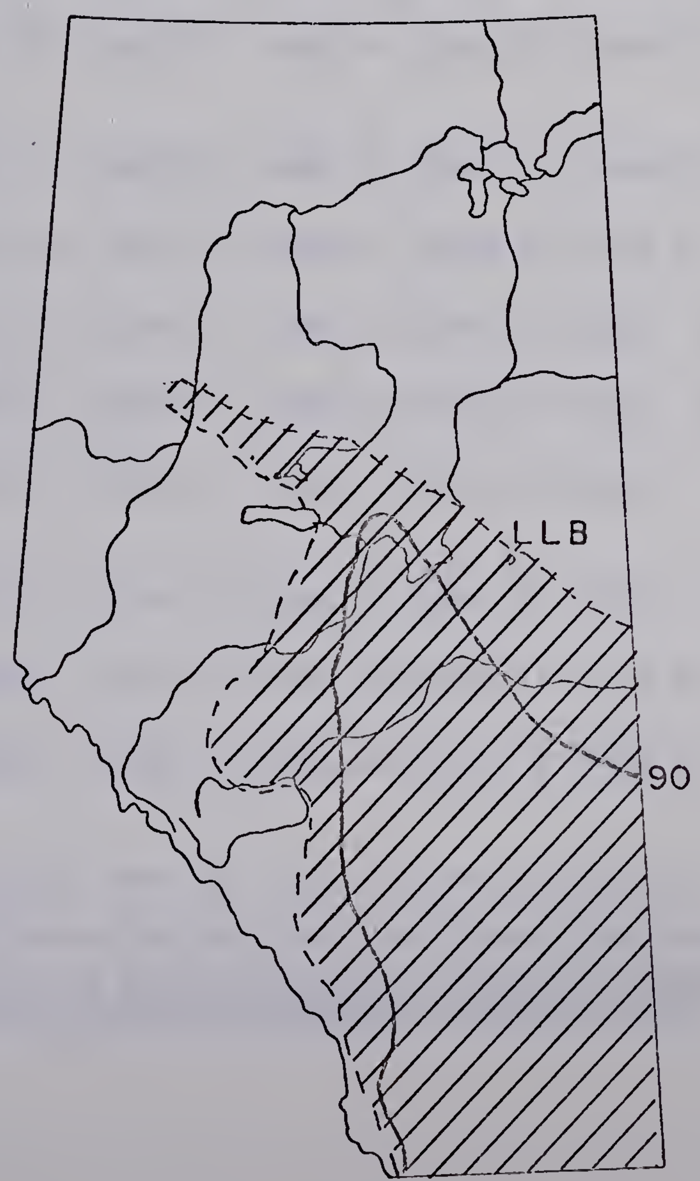
Over 90 F.F. days.

• Under 75 days.

× 75 - 89 days.

o 90 days or more.

FIGURE 2.8



Distribution of land under farms in relation to areas free of frost for less or more than 90 days.

Source : M.K. Bennett 1959.

Table 2.4

Spring Date of Last Critical Freeze for a Given Risk.

Temperature °F		24	26	28	30	32	34	40
Earliest		Apr 13	Apr 22	Apr 22	May 1	May 15	May 17	May 28
	90	Apr 21	Apr 25	May 1	May 9	May 18	May 26	June 9
	85	Apr 25	Apr 28	May 5	May 12	May 21	May 29	June 12
	80	Apr 27	Apr 30	May 8	May 15	May 24	May 31	June 15
	75	Apr 30	May 3	May 10	May 18	May 26	June 2	June 17
	70	May 2	May 5	May 12	May 20	May 28	June 3	June 19
Percentage Risk	65	May 3	May 6	May 14	May 22	May 30	June 5	June 21
	60	May 5	May 8	May 16	May 24	May 31	June 6	June 23
	55	May 7	May 10	May 18	May 26	June 2	June 7	June 25
	50	May 8	May 11	May 20	May 28	June 4	June 9	June 26
	45	May 10	May 13	May 21	May 30	June 5	June 10	June 28
	40	May 12	May 15	May 23	June 1	June 7	June 11	June 30
	35	May 14	May 17	May 25	June 3	June 9	June 13	July 2
	30	May 15	May 18	May 27	June 5	June 10	June 14	July 3
	25	May 17	May 20	May 29	June 7	June 12	June 16	July 5
	20	May 20	May 22	May 31	June 10	June 15	June 17	July 8
	15	May 22	May 25	June 3	June 13	June 17	June 19	July 10
	10	May 25	May 28	June 7	June 16	June 20	June 22	July 14
Latest		June 10	June 12	June 18	June 24	June 28	June 28	July 15

Source: Extracted from Coligado, A.C., Risk Analysis of Weekly Climatic Data for Agricultural and Irrigation Planning, Melfort, Saskatchewan.

Table 2.5

Autumn Date of First Critical Frost for a given Risk.

Temperature ^oF		40	38	36	32	30	28	26
Earliest		July 18	July 13	July 18	Aug 11	Aug 19	Aug 22	Sept 2
	10	July 18	July 28	Aug 2	Aug 22	Aug 30	Sept 5	Sept 10
	15	July 21	July 31	Aug 6	Aug 25	Sept 2	Sept 8	Sept 12
	20	July 25	Aug 4	Aug 9	Aug 28	Sept 4	Sept 10	Sept 15
	25	July 27	Aug 7	Aug 10	Aug 30	Sept 6	Sept 12	Sept 16
	30	July 30	Aug 9	Aug 14	Sept 1	Sept 8	Sept 14	Sept 18
Percent-age	35	Aug 1	Aug 11	Aug 17	Sept 3	Sept 10	Sept 15	Sept 20
Risk	40	Aug 3	Aug 14	Aug 19	Sept 5	Sept 12	Sept 17	Sept 21
	45	Aug 5	Aug 16	Aug 21	Sept 7	Sept 13	Sept 18	Sept 23
	50	Aug 7	Aug 18	Aug 23	Sept 8	Sept 15	Sept 20	Sept 24
	55	Aug 9	Aug 20	Aug 25	Sept 10	Sept 17	Sept 21	Sept 25
	60	Aug 11	Aug 22	Aug 27	Sept 12	Sept 18	Sept 22	Sept 27
	65	Aug 13	Aug 24	Aug 29	Sept 13	Sept 20	Sept 24	Sept 28
	70	Aug 15	Aug 26	Sept 1	Sept 15	Sept 21	Sept 25	Sept 30
	75	Aug 17	Aug 29	Sept 3	Sept 17	Sept 23	Sept 27	Oct 1
	80	Aug 20	Sept 1	Sept 6	Sept 19	Sept 25	Sept 29	Oct 3
	85	Aug 23	Sept 4	Sept 9	Sept 22	Sept 28	Oct 1	Oct 6
	90	Aug 27	Sept 8	Sept 13	Sept 25	Oct 1	Oct 4	Oct 8
Latest		Sept 2	Sept 7	Sept 23	Sept 28	Oct 1	Oct 19	Oct 20

Source: Extracted from Coligado, M.C., Risk Analysis of Weekly Climatic Data for Agricultural and Irrigation Planning, for Melfort, Saskatchewan.

The Growing Season

Plants require suitable temperature conditions in order that germination and growth take place. Low temperatures permit only slow growth, the minimum for wheat and barley being about 40° - 42° F. Daily throughout the growing season the accumulated temperatures over the threshold value of 42° F are totalled and the resultant total called "growing degree days". Wheat with a threshold of 42° F requires an accumulated total of approximately 2000 degree days for ripening. Opinions differ on the value of this method (Symons, 1967, p. 28). Gregory sums up the evidence on the value of accumulated temperatures or degree days by saying that:

> " .... if accumulated temperature has any significance or value, it lies in its definition of the minimum temperature conditions for growth .... Whether the limits of these be altitudinal or latitudinal". (Gregory, 1954, p. 60).

The figure of 1,750 growing degree days calculated by Chapman for the Lac La Biche area and given in Table 2.6 is lower than Symons' stipulated minimum for grain production. It is the smallest recorded total for Canada in an agricultural area; all other areas recording lower values lie outside the limits of agriculture[4].

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[4] Extracted from map following p. 8 in Chapman, L.D., *et al*., *Op. Cit*.

Table 2.6

Growing degree days for Lac La Biche.

Start of growing season (above 42°F mean temp.)	End of growing season (above 42°F)	Degree-days above 42° F	Mean spring frost date	Mean fall frost date	Number of frost free days
April 29	Oct 4	1,750	June 15	Aug 20	Approx. 70

Source: Extracted from Chapman, L.D., _et al._, _Climates of Canada for Agriculture_, 1966, pp. 6-9.

Employing the A.R.D.A. method for distinguishing temperature zones in terms of the average number of degree-days above 42° F and average length of the frost free season, the Lac La Biche area is rated Zone 7 (the lowest) for farming. Thus Lac La Biche by being placed in Zone 7 has "less than 1800 degree days and less than 75 frost-free days", this specification for A.R.D.A. Zone 7 being applicable in Alberta and Saskatchewan (Chapman, 1966, p. 13).

However, if Longley's figures of 2000 - 2200 degree-days are used combined with 75 - 90 frost-free days, this would place the area in Class 6 of the A.R.D.A. temperature classification. Economically this difference between Longley and Chapman is very important in its implications for viable agriculture. The 75 day frost free line roughly corresponds to the 2000 degree day line and can be taken as the boundary between Zone 6 and Zone 7. Frost hazard is severe for small grains north of this line, south of the line the hazard is serious.

The distinction between serious and severe is that with serious hazard wheat is reduced in quality by one or two grades but with practically no loss in yield. Severe hazard due to freezing reduces quality to feed grade and usually results in reduction in yield (Chapman, 1966, p. 9).

That the Lac La Biche area fulfills the minimum conditions for grain growing is borne out by the substantial quantities of grain grown and harvested there. While first class grades are rarely achieved for wheat, grades 3 and 4 Northern are common and grade 2 is not unknown. Historically the region acquired a reputation as an unfailing source of supply for wheat after Father Taché went there in 1860. In 1872 Taché declared that Lac La Biche was:

> " .... their (sic. the Catholic Missions) favourite wheat ground, where the crop could always be depended on" (Roe, 1952, p. 114).

The explanation of this extremely favourable view seems to lie in the fact that the Mission lands were right down on the lake shore and so experienced milder climatic conditions. Moreover plant growth is not directly proportional to the increase in temperature (Klages, 1942, p. 239). The more rapid development of certain plants at northern latitudes than at places further south is due largely to the acceleration which occurs when they are grown under the very long days of spring and summer in the far north, a phenomenon known as photoperiodism.

Photoperiodism

Long hours of sunlight at higher latitudes are a factor in agriculture which appears to annul to some extent the effects of a shorter growing season and a lower seasonal temperature. In 1939, M.W. Evans demonstrated that for early strains of timothy the season for heading and maturing progresses northward at a gradually accelerated rate (Evans, 1936, p. 217). In 1957 using a selection of small grains A.C. Carder compared growth rates at Madison, Wisconsin, and Beaverlodge, Alberta. He noted that long day length had a considerable effect in hastening development (Carder, 1957, p. 21). Calculations showed that as far as annual crops were concerned Beaverlodge received as much insolation as Madison, Wisconsin, despite the difference in latitude (12 degrees). With the exception of millet all crops at Beaverlodge developed to the heading stage at the same time as at Madison. It was found that oats required less time, barley more and wheat about the same as barley.

Since Beaverlodge is at latitude 55° 13' N and Lac La Biche at 54° 46' N, it can be assumed that the amount of insolation at each place is the same. In fact Longley rates both places as having 1200 hours of bright sunlight between May 1 and September 30 (Longley, 1968, p. 4). It would appear then that long day length at Lac La Biche during the growing season compensates for effective temperatures lower than those further south.

Unfortunately once heading has occurred the effect of greater insolation ceases to have a direct effect on crops, and subsequent development (that is, ripening) is dependent upon temperature. As

temperatures are considerably lower at northern latitudes, to ripen or not to ripen would appear to be the question. At Lac La Biche ripening would be entirely dependent upon the vagaries of an unseasonably early autumn frost or conversely an extended period of higher temperatures. The risk probability factor once again comes into play.

Moisture Conditions

The mean annual precipitation around Lac La Biche is low, less than 18 inches, most of which falls as rain in the summer months (Table 2.7).

Crop yields are dependent on two different amounts of rainfall:

(1) The "growing season" rainfall (at Lac La Biche from May through July of the crop year).

(2) The "crop season" rainfall (the growing season rainfall plus the autumn rainfall in August, September and October of the previous year).

The precipitation during the growing season at Lac La Biche is 6-8 inches, and during the crop season 10-12 inches. Precipitation for the other months consists almost entirely of snow. While the soil moisture supplies are doubtless helped by some of the snow melt water which penetrates into the ground, a large percentage is lost because the topography of the area with large amounts of sloping land induces surface runoff over the frozen ground.

Table 2.7

Monthly and Annual Precipitation in Inches for Lac La Biche.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Rain	.02	.01	.07	.31	1.2	2.46	2.83	2.74	1.75	.31	.10	.03	12.01
Snow	10.1	7.3	8.0	7.1	1.6	-	-	-	0.5	4.7	8.7	10.2	58.2
Precipitation	1.03	.74	.87	1.02	1.36	2.46	2.83	2.74	1.80	.78	.97	1.05	17.83

Source: Precipitation Normals for Alberta, CDS 5-65, May 1965, Climatology Div., Met. Br., Canada, Dept. of Transport, p. 5. These averages are based on the period of record of 10 to 24 years during the period 1931 to 1960. No adjustment factor has been used.

On a year round basis Lac La Biche is in an area of approximate water balance although rainfall during the growing season is seldom sufficient to meet total water requirements of grain crops (Pers. comm. A.H. Laycock, Jan 1969). Generally current rainfall is sufficient to meet crop requirements until heading takes place. From heading until ripening the moisture requirement of crops is in excess of precipitation. Crop requirements for filling the heads are drawn from soil moisture supplies. This results in a moisture deficiency over the region which varies with the type of soil, light sandy soils in the Caslan area being more deficient in moisture than the heavier clay soils south of Fork Lake.

On a growing season basis although not on an annual basis the Lac La Biche area has between 3 and 5 inches of moisture deficiency (Chapman, 1966, p. 14). Using the A.R.D.A. moisture classification the Lac La Biche region is rated class G for farming. According to Chapman this is the best moisture class for growing small grains on the Prairies (Chapman, 1966, p. 15). Class G reflects the favourable co-incidence of high precipitation and temperature at the right time of year for growing grain, and drier conditions later on which aid ripening and harvesting.

Droughts are uncommon, the expectancy being two every 40 years (Currie, 1959, p. 36). A droughty period is taken to be one with five consecutive days or longer which is not broken by a rain of at least 0.10 inches (Currie, 1959, p. 36). In other words reduced yields due to drought will occur approximately twice within the working lifetime of the average farmer. In fact the incidence of high

precipitation and a large number of days with rainfall carrying over into and beyond the harvest season is more likely. This is attended by difficulty in harvesting crops. The past year (1968) is illustrative of this point when harvesting conditions were made intolerable by unseasonably heavy rains in September (Table 2.8).

Lower than average precipitation up to and during the growing season for 1968 made initial crop growth later than usual. Although the eventual growing season rainfall totalled 4.96 inches compared to the normal average of 6.8 inches, heading was prolonged into August when only half the normal amount of rain fell in July. This series of delays due to fluctuations in precipitation induced postponement of harvesting operations to await ripening. Unfortunately early frost set in from August 12 forcing harvesting to be started around September 1 when most of the grain crops were still green.

Initially harvesting operations commenced on the frosted grain while the remainder ripened. However, exceptionally heavy rainfall set in and harvesting operations halted when temperature deficiencies of 1 to 3 degrees rendered drying conditions impossible. Precipitation was above normal throughout the area so that monthly totals for various meteorological stations were 2 or 3 times normal (Canad. Weather Review, Sept 1968, p. 1).

A total of 3.87 inches of rain, sleet and snow fell in September 1968, 2.07 inches above the normal figure. Expressed as a percentage, 215% of normal precipitation fell. In March 1969 a significant amount of grain in the study area was still lying in the fields proving that this area has serious climatic

Table 2.8

Monthly Precipitation in Inches for Lac La Biche 1968.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Rain	-	-	-	-	1.25	2.18	1.53	2.42	3.87	-	-	-	11.25
Snow (inches)	7.7	3.2	8.3	2.3	-	-	-	-	-	1.3	2.8	12.5	38.10
Precipi-	1.02	.22	.57	.38	1.25	2.18	1.53	2.42	3.87	.28	.35	1.02	15.09
Percentage of normal	99	30	66	37	92	89	54	88	215	36	36	97	
Inches above normal	-	-	-	-	-	-	-	-	2.07	-	-	-	
Inches below normal	.01	.52	.30	.64	.11	.28	1.30	.32	--	.50	.62	.03	

Source: Extracted from Canadian Weather Review, 6, Nos. 1-12, Met. Br., Canada, Dept. of Transport., 1968.

disadvantages which it is economically perilous for the grain farmer to ignore.

In the northern half of Alberta during the 26 year period 1916-41 there were 10 wet Septembers, 9 semi-wet, leaving only 7 dry years (Bowser, 1941-42, n.p.). However, if the precipitation data for October and November are analysed along with these September figures it shows that there is a 5:1 chance of weather being sufficiently dry for harvesting to proceed.

Storms and Hail

The climate of the study area is generally quiet in winter. Blizzards are a rare occurrence, the greatest causes of discomfort being cold and wind. Abnormal falls of snow during early spring and late autumn are never as deep as in winter. However, they usually have higher water equivalents and the snow tends to cling to objects. Snowfalls in early September are particularly damaging to crops still standing. The snow forces the grain to the ground and breaks the stems so that it fails to rise after the snow has melted.[5]

In summer, particularly from mid June to September, thunder storms of moderate intensity result from a combination of frontal and convectional causes. They usually start in the afternoon and

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[5]This condition is not exclusive to the Lac La Biche region, but can occur in any part of the Prairies. One of the severest falls recorded was in central Saskatchewan on Sept. 22-23, 1945, when 18 inches fell, flattening thousands of acres of crop. (Currie, 1945, p. 10)

come to an end within a few hours. As Currie points out:

> " .... Only the most general statements can be made concerning the regional distributions of thunderstorms because of the nature of the data. Some observers have designated all days on which thunder was heard as thunderstorm days, while others ignored all thunderstorms except those which passed over their stations and were accompanied by heavy rain, much lightning and hail". (Currie, 1959, p. 21)

The latter type of thunderstorm is of more interest to farmers because of its distructive capacity. Monthly thunderstorm frequencies in per cent of the annual average number of storms are shown in Table 2.9 for the Fort McMurray area, 100 miles north of Lac La Biche. Both areas have approximately the same type of thunderstorm activity.

Table 2.9

Thunderstorms at Fort McMurray as Per cent of Total Storms

Observed Years	Date	Apr	May	June	July	Aug	Sept	Oct	Yearly mean
22	N/A	1.4	7.3	24.0	37.7	21.9	7.3	0.4	12.4

Source: Extracted from Table 7 in Currie, B.W., Prairie Provinces and Northwest Territories Wind and Storms, Physics Dept., Univ. of Sask.

Thunderstorms reach their peak during July with the result that there is greater chance of hail when the grain has headed.

Hail occurs throughout the Lac La Biche area. Although hail storms do not reach the destructive capacity experienced in Alberta south of Edmonton they do reduce yields on significant acreages.

Generally there are about 2 hail days every crop year for the study area (Paul, 1967, p.5). However, hail day statistics represent the total number of days on which hail falls at a point and not the number of times on which hail falls. Therefore it is quite conceivable that on a given hail day there may be more than one hailstorm at any given point, that is, the number of hail falls may be greatly in excess of the number of hail days.

In 1968 hail occurred more frequently in the Caslan-Venice area to the west of Lac La Biche than in the more heavily forested area to the east. It is possible of course that this is a misconception due to the limited access into the forest areas and to the fact that hail damage is more visible in crops. Generally hailstorms struck between 4 p.m. and 8 p.m. in the late afternoon and evening.

Distribution of hail along the storm tracks was erratic. In July and August 1968 greatest damage was confined to strips up to 100 yards wide and from one mile to four miles in length. Wind blown hail caused more damage by beating down the crops. Fortunately in the Lac La Biche area hailstones seldom exceed pea size.

Climatic Classification for Agriculture

Combining the classifications arrived at for temperature and moisture efficiency, the Lac La Biche region is classified 7 G --- "under a severe handicap for agriculture" with respect to the Prairie Provinces.

In the Prairie Provinces the northern fringe of the agricultural areas has a serious frost hazard north of the August 25 isopleth for the mean fall frost date (Chapman, 1966, p. 8). The Lac La Biche

region lying in temperature zone 7 suffers from severe frost hazard for wheat and even oats and barley. The intense winter cold handicaps livestock enterprizes by adding an additional month on to the time for indoor feeding in comparison with central and southern Alberta. Depending upon the snow cover and the intensity of cold, a 50% variation in winter feed expense can be experienced (Oppenheimer, H.L., 1965, p. 73).

Combining this unfavourable temperature classification with the more favourable moisture class G does not really improve the picture. Class G is favourable only for grain farming while temperature class 7 is decidedly unfavourable for grain. Temperature appears to be the more important criterion upon which to base the capability of this region. Irrespective of which meteorologists' figures are used the Lac La Biche region still remains one of climatic difficulty for agriculture.

Relief

Topography

Lac La Biche is an area of moraines and former lake basins. The general topography is gently rolling interspersed with varying proportions of low poorly drained areas containing mossbogs, muskegs, large and small lakes and sloughs. Maximum elevation is just over 2000 feet, but much of the area lies under the 1800 foot contour (Fig. 2.9). The regional slope is northeast, with Caslan on the western boundary having an elevation of 2030 feet, Noral 1973 feet, Hylo 1885 feet, Venice 1875 feet and Lac La Biche 1835 feet.

The area round the lake at Lac La Biche is part of a lacustrine

RELIEF OF STUDY AREA

FIGURE 2.9

basin. This level to undulating area contains fine water-laid sediments that are underlain with bedrock of late Cretaceous age (Erlick, 1960, p. 30). Quite often the surface material is quite saline and unfit for agriculture.

The presence of glacial spillways, dumps and moraines around the lacustrine basin verify the passage of Pleistocene ice. Where lacustrine deposits change to glacial till the topography becomes rolling. East of Lac La Biche topography is extremely variable consisting of gently rolling to rolling knolls with short steep sided slopes (Lindsay, 1962, p. 46). The large glacial spillway of the Sand River forms the eastern boundary of the study area. Extending westwards for several miles from the spillway is a north-south line of washboard moraines. These features are from one to several miles in length, 300 feet wide, and have a local relief of about 35 feet.[6]

Parts of the region southeast of Lac La Biche are characterized by broad areas of flat to gently rolling ground moraine. In some places the land is almost completely featureless, but south of Beaver Lake there is an area of rolling till ridges that show a distinct northwest-southeast lineation (Lindsay, 1962, p. 46).

The western part of the study region from Lac La Biche to Caslan exhibits a landscape typical of the parkland areas of central Alberta. There are no high hills but a large proportion of the land is sloping and this is partially responsible for the presence of

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[6]Personal survey using an Abney level August 1968.

fairly large areas of swamp and muskeg in the bottom lands.

A band of drumlins and flutings 20 miles wide extends south-eastward from the Athabasca River across the western part of the study area (Gravenor, 1961, p. 41). Their long easily detectable wave-length contributes to the rolling character of the topography. At the same time this provides the region with fairly flat uplands upon which most of the farmsteads are located.

The one feature with marked relief in the Lac La Biche area is the ice marginal meltwater channel of the Amisk and Beaver Rivers. Cutting across the region in the usual northwest - southeast direction it eventually forms the southern boundary of I.D. 102 and the study area. The channel itself has a depth of almost 200 feet and a width of approximately one mile. The side slopes range from 8½% to 17% and thus have little agricultural value except as forest land[7].

Slopes in the Lac La Biche region with the exception of an area of hummocky disintegration moraine south and east of Fork Lake are nowhere great enough to prevent use of the land for agricultural purposes. However, when compared with smooth land the area is not as level or as suitable for large scale farm machinery. Both the degree of slope and the pattern or frequency of slopes in different directions are important factors in increasing the cost of farming and in decreasing the uniformity of growth and maturity of crops. Using the A.R.D.A. land capability classification, Fig. 2.10 shows where topography is a limiting factor for farming. The categories

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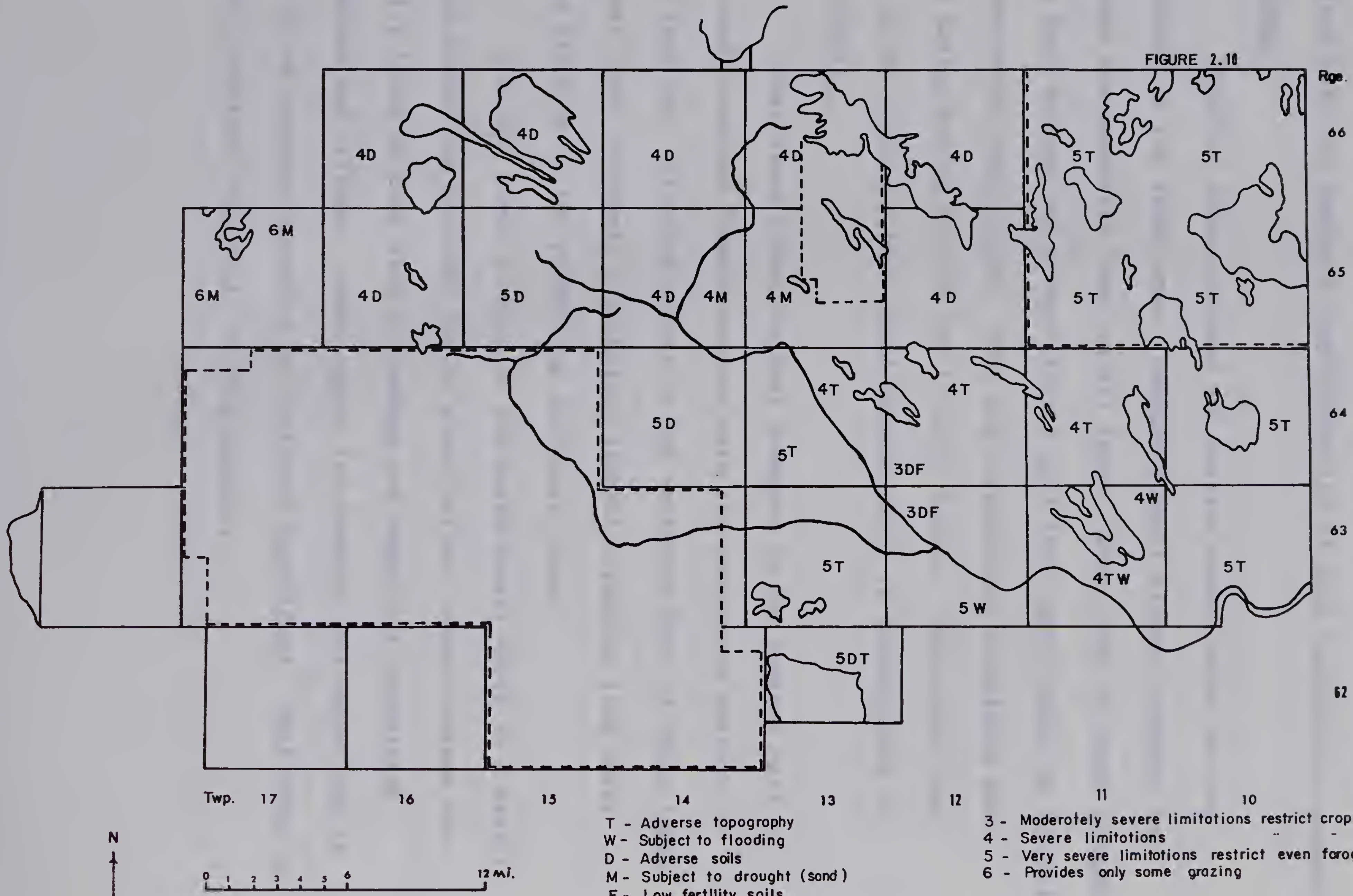
[7]Personal survey using an Abney level August 1968.

LAND CAPABILITY

FIGURE 2.10



T - Adverse topography
W - Subject to flooding
D - Adverse soils
M - Subject to drought (sand)
F - Low fertility soils

3 - Moderately severe limitations restrict crop choice
4 - Severe limitations " "
5 - Very severe limitations restrict even forages
6 - Provides only some grazing

Source : A.R.D.A. Land Capability Classification 1969.

shown on Fig. 2.10 have been broadly generalized for thesis presentation so that only the dominant characteristics of each township are mapped.

Drainage

Numerous lakes, streams and smaller water bodies dot the landscape of the study area. Similarly small sloughs, marshes and muskegs are generally found on all farms. While some of these sloughs have been drained and produce fairly good land, most remain as obstacles to mechanized agriculture. Some are intermittent containing water only during spring run-off and in early summer. Thereafter they dry up and develop a hard baked surface which is inhospitable to cultivation.

Large sized lakes are most numerous in the eastern half of the study area and often interfere with the continuous pattern of farm land use. Flooding occurs at the southeast ends of these lakes because their northwest - southeast lineation permits lake water to be piled up by the prevailing northwest winds.

The only river of note is the Amish-Beaver which is a misfit stream meandering placidly in its giant valley. Water courses are usually lined on each side by muskegs and sedge bogs containing jackpines and willows. Water supply for domestic and animal use is said to be adequate according to residents questioned. This water is usually obtained from wells on farm property.

Soils

The predominant soils around Lac La Biche are Grey Wooded. This soil group is one of the podzolic order found south of the permafrost. Like all podzolic soils, grey wooded soils are characterized by an impoverished grey layer at or near the surface which gives the soil its name.

Grey wooded soils have developed under cooler conditions where more effective precipitation than in the grasslands has resulted in leaching of minerals to lower horizons. A typical grey wooded profile has a leaf mat on the surface (L-horizon) underlain by an accumulation of decomposed leaf mould (H-horizon). These two soil horizons vary in depth from one to four inches. Below this is the Ah horizon of dark humus and mineral material. This is the productive portion of any soil for agriculture, and unfortunately in grey wooded soils this horizon is usually less than one inch and always less than two inches deep (Togood, 1962, p..9). The next horizon (Ae) is the distinctive grey layer which gives the soil its name. This horizon is low in organic matter and usually varies from four to 12 inches in thickness. The grey colour is due to the low humus content and the effects of centuries of leaching. Grey wooded soils therefore have a much lower natural fertility than grassland soils.

An early map published by the Topographical Surveys Office in 1922 shows the major soil around Lac La Biche to be sandy loam (Fig 2.11).[8] Numerous patches of peat consisting of more or less

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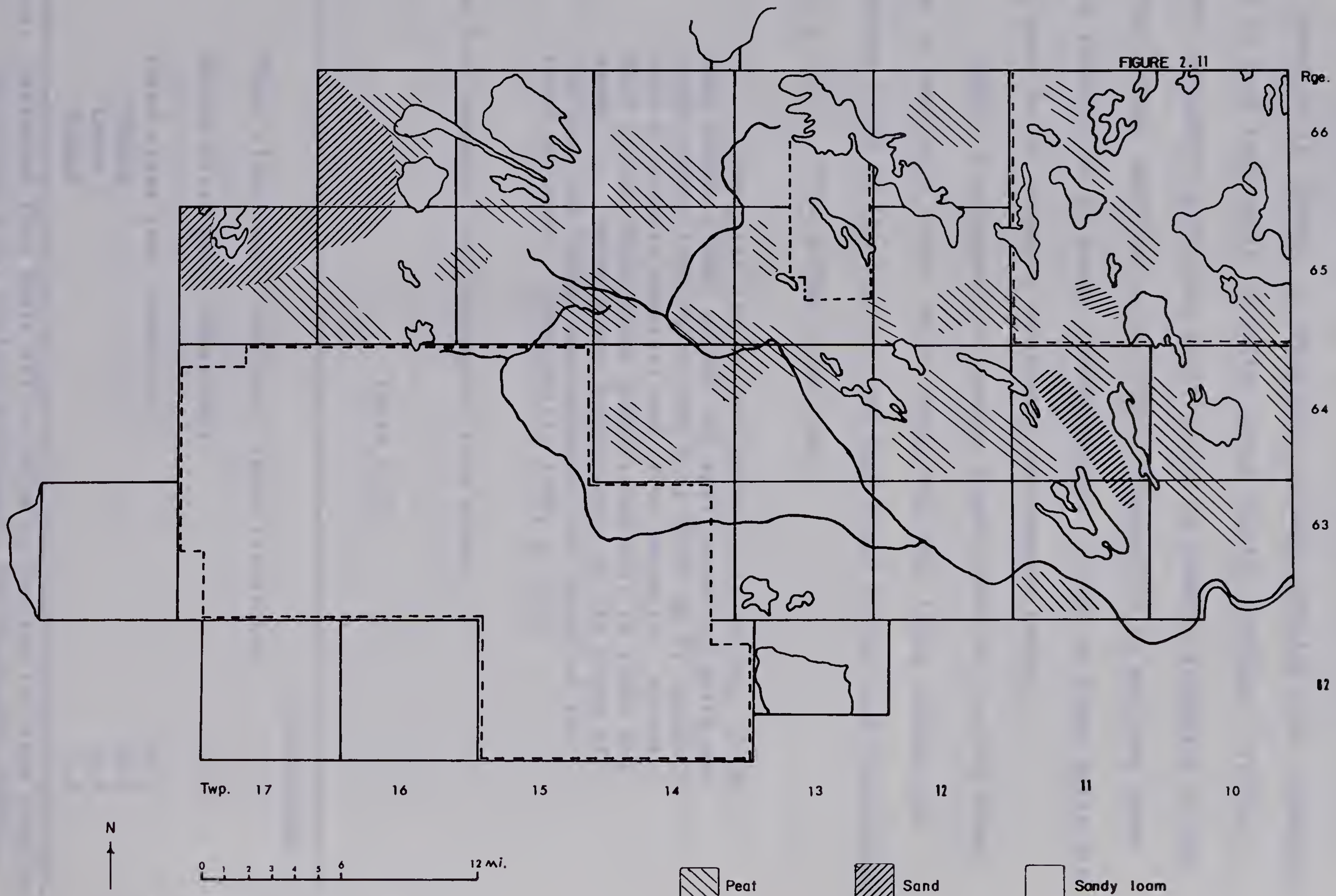
[8]Canada, Map of the Main Soil Types of Lac La Biche District, Surveyor Generals' Office, Ottawa, 1922.

FIGURE 2.11

MAIN SOIL TYPES (1922 SURVEY)



Source : Topographical Surveys Office 1922.

decayed vegetable matter have accumulated in swampy areas which are found on all farms. A large area of sand covering four townships east of Buck Lake north of Caslan poses erosion problems. Without proper management practices specifically as regards ploughing on the contour, these sandy soils are highly susceptible to gullying under heavy rainfall as in summer thunderstorms. Yields on these soils are very poor due to moisture deficiency and drought hazard.

There is evidence from another unpublished soil survey undertaken in the early 1930's which covers the area lying between the Athabasca river on the west and the Sand river on the east (Mackintosh, 1934, p. 215). This survey found that:

> " .... the soils (apart from muskegs) all belong to the grey timber class, except for small areas of delta and river bottom land which have been built up by accumulation of organic material and river deposits. Almost half of the third class grey timber soil is light and sandy .... Muskegs and swamps occur in all parts of the area and occupy approximately one fourth of the total surface". (Vanderhill, 1959, p. 215)

Table 2.10 presents the findings of this survey.

Table 2.10

		Percentage
(1)	First class grey timber soil (grey transition)	6.3
(2)	Second class grey timber soil	8.6
(3)	Third class grey timber soil	50.0
	Muskeg	25.8
	Lakes	8.5
	Eroded	0.8

Source: Extracted from Table VII -- Soils of the Lac La Biche Area in Mackintosh W.A., Prairie Settlement, The Geographic Setting Appendix on Soils, p. 215.

Classification in the first three greys was based primarily on the depth of the surface layer (see earlier discussion), the extent of leaching, the cost of clearing, and the character of the topography (Pers. comm. Alberta Soil Surveys, Feb, 1969). Under this classification 85% of the Lac La Biche area is unfit for agriculture. In the early 1930's it was recommended by soil experts that third class grey wooded soils be closed to settlement and converted to forest. This advice has long since been neglected and settlement has spread across the region.

Preliminary soil surveys around Lac La Biche by Alberta Soil Surveys in the summers of 1967 and 1968 prove these earlier findings essentially correct. The characteristic soils are grey wooded but the classification is not based on soils alone like the 1930 survey. The 1967-68 preliminary survey delimits the agricultural potential of broad general areas based on an assessment of soils, climate and topography. Various combinations of these criteria can result in two categorized areas having the same agricultural potential, but whereas in one area the dominant factor may be soils, topography may be decisive in the other. The following rating was applied to the Lac La Biche area (Fig. 2.12):

(a) Potentially arable -- No. 1.

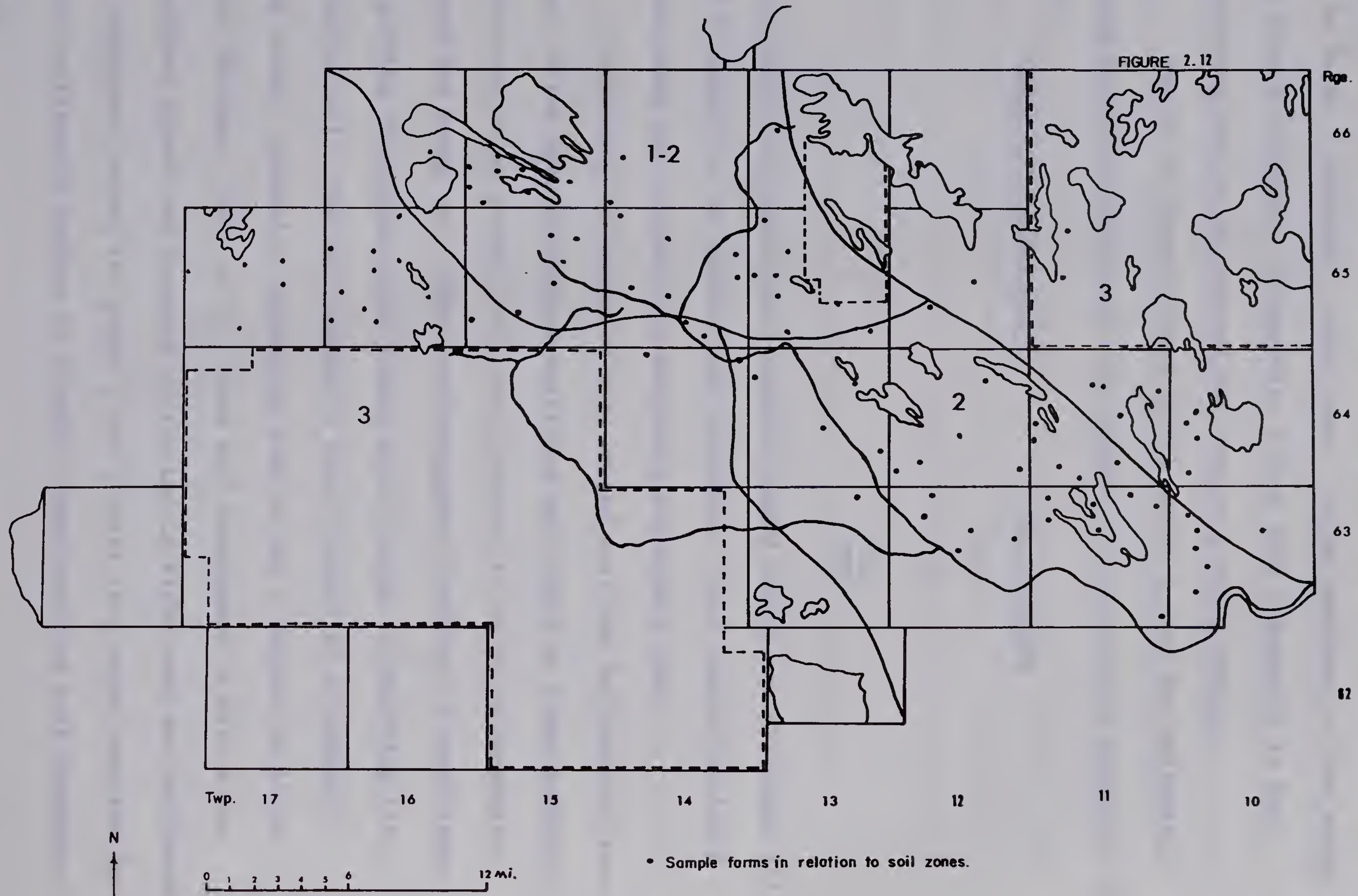
(b) Doubtfully arable -- No. 2.

(c) Definitely non arable -- No. 3.

Using approximations more than half of the Lac La Biche region falls into No. 3 or the non arable category. There is no definitely

FIGURE 2.12

DISTRIBUTION OF GREY WOODED SOILS



Source : Alberta Soil Surveys.

No. 1 arable land, the best land being rated a mixture of 1-2 in the Lac La Biche - Craigend - Noral area. In the southeast of the study area around Craigend - Briereville - Fork Lake topography is the controlling factor and reduces the area to a No. 2 rating.

Out of 97 farms visited in the sample survey the following is their grading distribution with respect to agricultural potential (Fig. 2.12).

Agricultural Potential	No. of farms
1-2	29
2	37
3	31
	97

Agricultural settlement has therefore spread fairly evenly across all land irrespective of agricultural potential. As a result one third of the farms are located on potentially non-arable land.

Generally all types of grey wooded soil are deficient to some extent in the essential plant nutrients and, while at times producing satisfactory crop yields, will only continue to do so if carefully managed and built up. Under good management, the use of fertilizers and growing of legumes, grey wooded soils change to something like a Prairie soil. The soil assumes a brown instead of a brownish black colour, gradually lightening down to the C horizon at 15-20 inches (Kellogg, 1950, p. 9). Good soil management is with a few exceptions almost non existent in the Lac La Biche area and settlement has progressed beyond the grade 1 and 2 soils into areas unsuited for arable cultivation because of climate, topography and soil characteristics.

Summary

The Lac La Biche region has a hazardous climate for agriculture. Only certain crops can be grown economically in the region, and even these are limited to some extent. It has been suggested that farmers adopt livestock rearing instead of grain growing thereby taking advantage of the ability of the region to produce reasonably good hay and forage crops. Overlooked in this argument is the fact that weather limits livestock rearing in the same way it limits grain growing, so that the cost of livestock rearing is greater than in more congenial environments.

Poor soils are so widespread in the study area that approximately one third of the study sample farmers were located on land rated as non-arable. The other soils are also relatively impoverished and require special farming practices for farming to be economic. However, good soil management is almost non existent.

When poor soils and poor climatic conditions are found in combination, they make for an environment which is inhospitable to economic agriculture. There is an adversity about the region that calls for a 'good' farmer to overcome it.

CHAPTER III

THE DEVELOPMENT OF AGRICULTURE AT LAC LA BICHE

Before an analysis is made of the present agricultural system at Lac La Biche, it is necessary to consider the settling of the area. Lewis considers success of settlement to be dependent generally on the following factors: "Choosing the right settlers; physical preparation of the site before the settlers arrive; settlers' capital; the organization of group activities; the acreage per settler; and the conditions of tenure". (Lewis, 1964, p. 299)

These criteria listed by Lewis for successful settlement were never applied in the Lac La Biche region, nor for that matter in Western Canada. Many government policies tend to be conceived by trial and error, and hindsight enables past mistakes to be rectified. It is with the advantages of hindsight that settlement around Lac La Biche is assessed, bearing in mind the criteria that Lewis postulated.

Settlement

The history of settlement of the Lac La Biche area, in particular its early history, is chiefly associated with the growth of the Roman Catholic church in northeastern Alberta. The start of agriculture effectively dates from the establishment of the Lac La Biche mission in 1853. The original efforts were directed towards the Metis population in an effort to settle the roving bands left behind on the Plains by the decline of the fur trade. In fact the neighbouring settlement was specially named St Paul des Métis when

it became the centre of the church's activities in the area.

Although there were probably a few hunters and fishermen in the area who cultivated vegetable gardens prior to 1850, it was the mission which provided the nucleus for a stable community based on agriculture. By the end of the 19th century some farming was taking place in the vicinity of the mission. The success of these farms was such that they acquired a reputation as "an unfailing supply of wheat, both for the Catholic missions of the area, and for general use" (Roe, 1952, p. 114). So far as the white population is concerned, settlement began in this region during the period 1900 to 1905 (Kristjanson, 1947, p. 9).

Before the arrival of white settlers early this century the church was by far the most active colonizing agent, engaging in this work in an organized fashion as early as 1896 when Father Lacombe asked for assistance from the Dominion government.

While a few settlers had been moving into the Lac La Biche region towards the turn of the century, a general influx did not occur until the first two decades of the 20th century. In his History of the Catholic Church in Alberta, the Most Rev. E.J. Legal O.M.I. commented that in 1907, " .... it was useless to discourage this tide which was about to be further increased .... it was resolved to bring in a select class of excellent colonists to occupy the magnificent lands east and north of the settlement (of St Paul des Métis) as far as the valley of the Beaver River (Legal, 1914, p. 20). The "selected" settlers were mostly French Canadians from the marginal soil areas of Quebec and Eastern Canada.

An attempt to reconstruct the movement of settlers into the Lac La Biche region from small scale maps by Odynsky and Murchie, supplemented by settlement maps in the University of Alberta Map Collection dating from 1901 to 1914 is shown in Fig. 3.1. (Odynsky, 1960, pp. 10-13; Murchie, 1936, pp. 8-14). The area around the present site of Lac La Biche was the first district settled. The trading post and mission were located here and the fact that the south shore of Lac La Biche had been surveyed into long rectangular river-type lots was an additional attraction. These lots were surveyed in the mid 1890's, about 10 years before other surveys were conducted outside the immediate vicinity of the Mission[1].

In terms of land clearance the area was attractive because of forest fires which had swept through from time to time producing a more open type of country than is normal today. One of the older residents remarked that when he moved into the area in 1911 he was able to see his cattle grazing three miles away. From 1911 until the late 1920's the country was open and park like, the only trees being "large timber" with trunks 20-24 inches in diameter. These larger trees withstood the fires set by the farmers to burn the grass during spring run-off which controlled the burning (Pers. com. Mr. G. Foster, Goose Lake, Aug 9, 1968). Uncontrolled burning by Indians in an attempt to copy these practices lit at the wrong time of year

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[1]Data taken from map of Lac La Biche Settlement in Provincial Land Registry Office, Lac La Biche, 11 July 1968, also from surveyors notebook of W.H. Waddell, D.L.S. dated Oct-Nov 1908, examined at Alberta Dept. of Highways, Edmonton, March 1969.

[illegible]

[illegible]

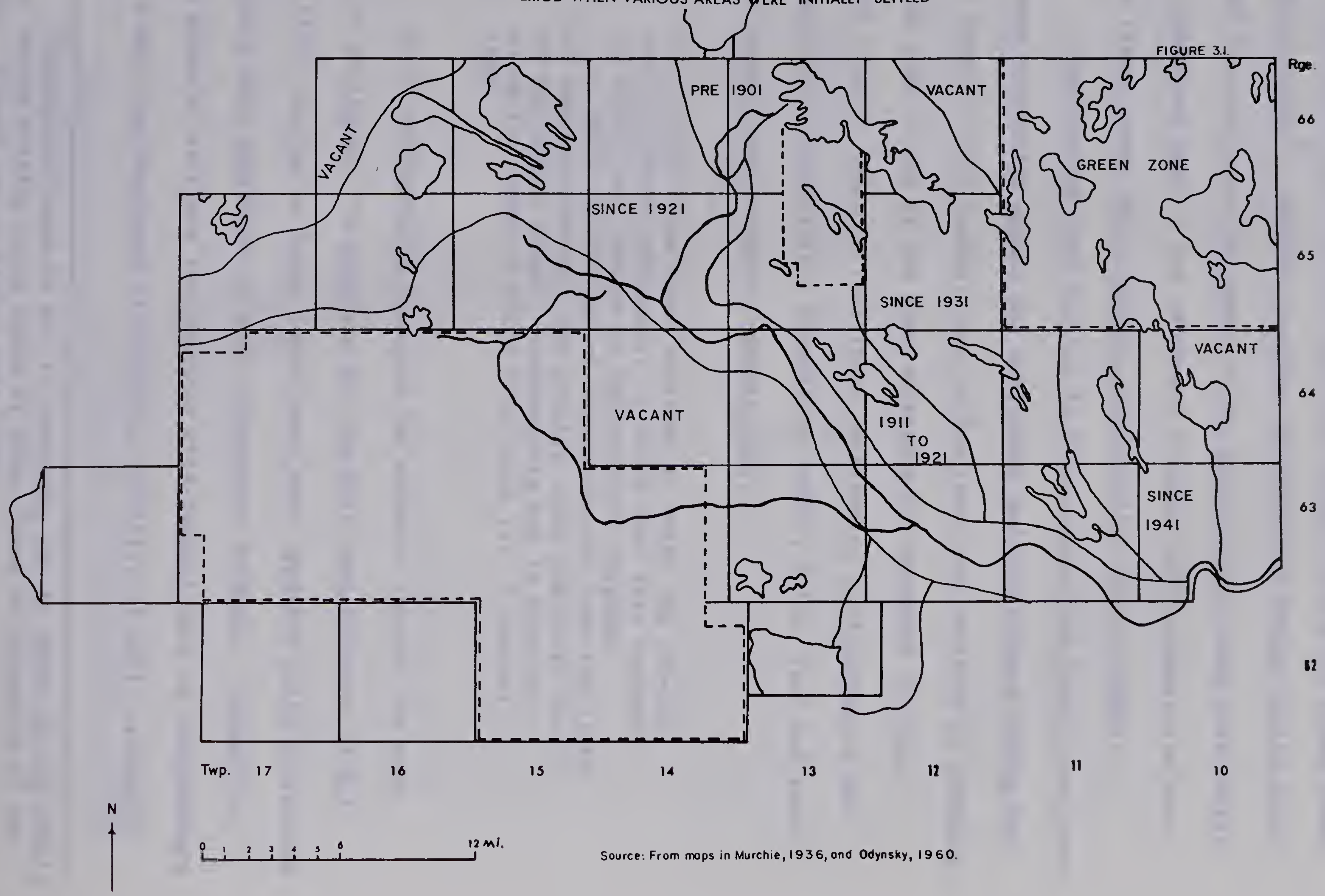
[illegible]

[illegible]

FIGURE 3.1

SETTLEMENT PROCESS

BY PERIOD WHEN VARIOUS AREAS WERE INITIALLY SETTLED



Source: From maps in Murchie, 1936, and Odynsky, 1960.

led to government intervention, but by that time all the large trees had been burned[2]. Another resident recalled his father saying that he ran his cattle on the banks of the Beaver River which were fairly open grassland then -- and which are covered with impenetrable bush today (Pers. comm. Mr.A..Kaufman, Briereville, July 29 1968).

Confirmation that the Lac La Biche region did have a more open and more attractive aspect for settlement and agriculture during the early years of this century than it has today was obtained by checking the log book of one of the land surveyors who surveyed the area. At that time in order to facilitate settlement, land surveyors had to report on accessibility, capability, water, soils, fuel and game. In his report this surveyor comments that:

> ".... apart from those sections in which the sub-soil is of a stoney character. I think that this township is fairly well suited to agricultural purposes.
> .... small quantities of hay may be cut from the flats on small patches of open country along the north bank of the Beaver River. Considerable hay is also cut along the flats of White Fish Creek .... " (Waddell, 1908)

On an accompanying traverse the surveyor records the tree cover as scattered. To settlers for the most part ignorant of soil capability, the Lac La Biche region must have appeared quite attractive especially when supported by such documentary evidence. Indeed the reason given by settlers for choosing this general area of northeastern Alberta was "the abundance of wildlife, fertility of soil, proximity

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[2]Photograph taken by Mr. P. Stefanjk, Lac La Biche in mid 1930's showing wagons driving round boles of large trees on outskirts of Lac La Biche. Viewed Lac La Biche, Sept 1968.

of lakes, abundance of pine trees for lumber and poplar trees for fuel" (Frontier Days, A Supplement of the Bonnyville Tribune, Aug 2, 1957, p. 2, quoted in Campbell, 1966, p. 14).

Population Growth

Migration into the Lac La Biche area was heaviest during the ten-year period 1911-1921 and in the ten years between 1926 and 1936 (Table 3.1). The farmers interviewed in this study came to the area for the most part in 1926 or later.

Table 3.1

Population Trends: Lac La Biche Area 1901-1966.

Year	C.D. 12	I.D. 102	Town of Lac La Biche	Study area Farm Population	Study area Farm Operators
1901	3,425	460	--	430	--
1911	11,185	821	--	821	--
1921	23,723	2,233	75	1,647	295
1926	--	--	--	1,101	261
1931	34,400	3,214	313	1,847	551
1936	--	--	--	2,434	569
1941	43,973	5,391	517	3,016	721
1951	39,886	6,021	905	3,216	721
1961	47,310	6,154	1,314	1,819	421
1966	--	--	--	1,814	392

Source: V.T. Janssen, et al., Population Characteristics: Alberta Census Division 12, pp. 21-22; and calculated from Census of Canada 1901-1966, Census Farms Population, No. of Operators.

As in much of Western Canada the impetus for settlement and agricultural development early in this century came with the projected construction and subsequent construction of a railway line. In this case the railway was built from Edmonton to Lac La Biche in 1914. Opinions differ as to whether railways followed settlers or brought settlement. Doubtless both views are valid to some extent, but a population increase from 821 to 2,233 which occurred between 1911 and 1921 seems to reflect the influence of the railway. Morton felt that the increase came immediately after the war, doubtless reflecting Veteran Settlement Schemes as well as renewed immigration (Morton, 1938, p. 147).

The period 1926-1936 differed from the early period of settlement because in addition to renewed immigration from Europe after the war, the bouyancy of postwar economic conditions encouraged the northward expansion of agriculture until the onset of the depression in 1929. Furthermore in the late 1920's and early 1930's a succession of dry years resulting in crop failures and economic distress in the more arid parts of southern Saskatchewan and Alberta accelerated this northward expansion. An internal migration commenced as uneconomic farms were abandoned and farmers moved northward to more effective precipitation areas and cheap or free land. The Beaver River country in northeastern Alberta was a favourite location, and the Lac La Biche area received the majority of its immigrant settlers during the two decades after World War I. In the study area, the number of farmers approximately doubled between 1921 and 1931, while between 1931 and 1941 the farm population had a 60% increase (Table 3.1). It is

[illegible]

[illegible]

[illegible]

interesting to note that the farmers moving from the south left lands that were climatically marginal as regards precipitation and moved to areas that had adequate rainfall but which were destined to become economically marginal within twenty years due to the small size of the farms. In addition, under the farming system which operates today, they are again climatically marginal for commercial farming because of their emphasis on wheat. Wood states that by 1930 there was a scarcity of arable land of good quality in Alberta. Most of the land in the better soil zones was settled prior to 1930 with the result that settlement after that date was on land that was sub-marginal (Wood, 1953, p. 55). Most settlement after 1930 took place in northern areas, of which Lac La Biche is a good example. The resettlement which took place was to a large extent government financed. A farmer wishing to relocate could obtain a $600 loan to move his possessions, but this did not provide him with the necessary capital required to participate in the new farming culture evolving in the late 1930. These farmers located in areas of cheaper (and poorer) soils and the groundwork was laid for the marginal economy of today. The mere fact that a loan was required suggests a severe lack of capital, its repayment from pioneer farms would maintain that severe shortage of cash.

From 1941 until the present day the population in the study area has stood still or has shown a progressive decline (Table 3.1). The number of farm operators did not change from 1941 to 1951 during the period of the second World War and subsequent mechanization of agriculture. By 1950 the conversion to mechanical power and new

technology was virtually complete, farms were increasing in size and the number of farm operators started to decline. By 1966 there was just over half the number of farm operators there had been in 1951 although to some extent this decline was attributable to the change in census definition of 'farm' between 1951 and 1961 (Biays, 1964, p. 226).

Land Utilization Changes

By 1921 less than 20% of the land around Lac La Biche had been occupied and less than one fifth of this occupied land was improved (Mackintosh, 1934, pp. 60-61; also Table 3.2). Each settler like his counterpart elsewhere was responsible for clearing his own land, and only very small amounts of land could be cleared annually by hand methods, generally less than eight acres (Robinson, 1952, p. 659). As a result agriculture had not yet reached the exploitive stage, and settlers concentrated on raising some oats and barley for livestock. The isolated character of the Lac La Biche pioneer community virtually dictated a livestock economy. Initially communications and transportation were poor and the homesteader had to produce commodities of small density per unit value.

Increase in area occupied by farms during the following ten years amounted to 137% of the 1921 level. The expansion between 1921 and 1931 under conditions of a rising price level continued until 1941 in spite of the onset of depressed economic conditions. The decade 1926-1936 was the period of most active settlement around Lac La Biche. In this period an internal expansion also occurred in that the cultivated area increased from 13% to 21% of the total area occupied by farms.

However, this is not unexpected as most farm families were confined to the farm during the depression because no outside work existed. The logical economic alternative adopted by many farmers was to clear as much land as possible.

Table 3.2

Land Use in the Lac La Biche Study Area 1921-1966.

		1921	1931	1941	1951	1961	1966
Area Owned	Ac	50,905	120,769	167,083	202,193	195,954	180,320
Acres Improved:-							
Total	Ac	5,882	16,687	34,909	64,321	77,735	84,487
Field Crops	%	78	72	73	73	66	75
Fallow	%	16	18	17	22	18	13
Pasture	%	2	2	4	5	12	9
Acres Unimproved:-							
Total	Ac	42,703	104,081	132,174	137,872	118,219	142,378
Woodland	%	63	43	38	37	39	16
Prairie or Natural Pasture	%	31	43	47	53	60	84
Marsh or Waste	%	10	21	21	--	--	--

Source:- Census of Canada 1921-1966, and Field Work 1967 and 1968.

There has been a general expansion in acreage of all crops since 1921. The chief increase occurred in wheat acreage prior to 1951 and in cultivated hay acreage from 1941 to the present time.

Table 3.3

Trends in Production of Field Crops 1921-1966.

	1921 Acres	1931 Ac	% Inc.	1941 Ac	% Inc.	1951 Ac	% Inc.	1961 Ac	% Inc.	1966 Ac	% Inc
Wheat	675	5,385	+690	7,455	+38	13,932	+87	9,466	-32	11,234	+18
Oats	2,357	4,551	+ 93	9,706	+113	11,321	+16	11,090	- 1	8,813	-20
Barley	92	929	+910	3,365	+262	9,076	+170	5,236	-42	6,462	+23
Cultivated Hay	158	449	+184	3,738	+732	14,117	+200	15,930	+12	24,432	+53

Source: Census of Canada 1921-1966.

The new settlers who homesteaded in the Lac La Biche area in the 1930's brought a wheat culture with them from the grasslands further south and the period of major exploitive agriculture commenced around Lac La Biche with wheat as the cash crop. It displaced oats the earlier maturing feed crop temporarily as the principal grain crop in the area in the 1930's (Table 3.3). The fact that oats recovered the premier spot in 1941 was no doubt due to the Wheat Acreage Reduction Act instituted during the depression, and also to the comparative advantage of growing coarse grains more suitable to the northern climate. However, by 1951 wheat was again the main cash crop in the area, encouraged by the post wartime food shortages. This emphasis on wheat has been maintained until the present day with the exception of a few years around 1960 which showed a 32% reduction in wheat acreage and oats was once again the leading crop by acreage. This was due to two factors, firstly a minor recession in the North American economy between 1958-60, and secondly very poor weather during the growing seasons in these years. The weather factor registers on the acreages of all grain crops which show that wheat and barley suffered severely and oats had a slight reduction. By 1966 wheat was once again the main grain crop. The 18% increase in wheat acreage between 1961 and 1966 was approximately balanced by a 20% reduction in the acreage sown to oats.

These figures bear out the comments in Chapter II that the area is climatically marginal for grains especially wheat. However, when economic incentives exert a strong enough pull as the Russian wheat sales of 1964-65 did, wheat will be grown.

With the exception of 1961 barley has recorded progressive increases in acreage since 1921. The 42% reduction in 1961 was doubtless due to climatic factors because barley is almost as sensitive as wheat to poor weather conditions. It is worth noting that barley acreage had again increased by 1966, and that it is the second most profitable cash grain after wheat.

The steady increase in the cultivated hay acreage recorded by every Census is significant because it reflects a trend towards a greater production of legumes as fodder crop. Combining this trend with the livestock trends over the years (Table 3.4) it is obvious that the increase in hay acreage complements the increase in cattle production. Table 3.4 shows the livestock trends from 1931 to 1966 using 1931 as a base figure.

Table 3.4

Indices of Livestock Production 1931-1966

	1931 No.	1931	1941	1951	1961	1966
Cattle	2,840	100	179	193	300	444
Pigs	1,747	100	447	376	478	292
Sheep	2,367	100	113	56	93	18
Horses	1,772	100	172	144	39	33
Poultry	23,108	100	164	59	134	126

Source: Census of Canada 1931-1966.

The increase in the livestock population in the study area has not been uniform. The first significant increase was in pig production in 1941 under the demands of a wartime economy, and due

to the fact that pigs are excellent for small farms. While there has been a general overall increase in production, the hog population has fluctuated widely due probably to price fluctuations and market conditions. A subsidiary reason is the overall economy of the area has changed. In 1941 this was still a pioneering region just coming out of a depression. Pioneer farms were of a subsistence character previously, but between 1941 and 1951 with the introduction of new technology, the farming system changed from pioneer farms to cash grain and cattle. It is interesting to note that the sheep population has fluctuated sharply in much the same way as the pig population although the total number of sheep is now very much smaller than in the past thirty five years.

The overall decline in the number of horses as mechanization proceeded on farms is a further measure of the change from a pioneer to a commercial economy. The region was also entering the era of the low production farm and the marginal farmer.

The growth of cattle numbers was gradual until after 1951. In the twenty years between 1931-1951 cattle numbers almost doubled and can be explained by the influx of new settlers. In the decade 1951-1961 the number of cattle rose by 107 index points from 193 to 300, and in the following five years by a further 144 index points to 444. In the late 50's and early 60's the Dept. of Agriculture started to emphasise cattle as an alternative to wheat.

<u>The Resultant Pattern</u>

By 1940 the settlement pattern which exists today had to a large extent evolved. The current pattern reflects the settlement

pattern of the early homestead era with its strict limitation on farm size with the quarter section as the standard unit. It seems by all counts to bear out the settlement hypotheses especially as presented by Galbraith (Galbraith, 1956) as the main reason for marginal farming and rural poverty.

The expansion of wheat growing in the 1930's led to an increase in farm size in the area[3]. Homesteaders were allowed by pre-emption laws to buy an adjacent quarter with a deposit of one third of its assessed value and the balance in five annual instalments. However, only the more affluent settlers were able to take advantage of this around Lac La Biche and farms continued to range between 160-320 acres. This did much to determine the eventual form and scale of farm operations in the study area, and is the main reason for the area becoming economically marginal in the 1950's.

With the introduction of new technology after World War II farm size increased on the average in the Lac La Biche area. Through the interacting process of farm abandonment and farm consolidation, farm size has shown a progressive increase since 1951 (Table 3.5).

Table 3.5

Increase in Farm Size ID 102 1951-1966

	1951	1961	1966
Total number of farms	784	632	588
Average size	321	413	520
Acres cultivated	114	164	210

Source: Census of Canada, Vol. 2, 1951, 61, 66.

[3]By 1930 the free homestead of 160 acres had ceased to be the staple farm in Western Canada. The average holding in Saskatchewan in 1930 was 389 acres (Morton, 1938, p. 500).

Prior to 1940 only about 80 quarter sections in any township were available for free homesteading, the remainder being railway, school and Hudson's Bay lands. The effects of this are clearly visible on an occupance map today. In the study area only 1,127 quarters are occupied out of a possible 3,284 in 25 townships, an average of 45 per township. However, the range is much greater, extending from 7 in Twp. 63 Rg. 13 in the south of the area, to 88 in Twp. 66 Rg. 15 in the Venice-Hylo area west of Lac La Biche.

Around Lac La Biche the better soils and flat areas around Craigend, Venice and Hylo were homesteaded first, in the 1920's and 30's. At Craigend 76 quarters are occupied in that township (65, Rg. 13) while in the four townships around Venice-Hylo, 88, 87, 86 and 85 quarters are currently occupied. Late comers to the region received progressively poorer land in the fringe areas at greater distances from towns and communications. By 1940 new settlement was taking the form of a filling in process by the purchase of land from the railway and Hudson's Bay Co. rather than new homesteading. Around towns and villages agricultural communities were gradually expanding and the amount of cleared land was becoming significant. The standard prairie spacing of seven to eight miles between villages like Caslan, Noral, and Venice on the railway line provided excellent foci for agricultural communities until the advent of the automobile.

East of Lac La Biche poor soils and the presence of the forest Green Belt which is closed to settlement by government decree inhibited further homesteading. In a similar fashion Caslan Metis Colony No. 7 in the south of the study area provided an effective

barrier to expansion southwards. Even today agriculture has only approached this boundary at discontinuous spots.

Summary

The evolution of a marginal farming area can be traced in the history of Lac La Biche. The groundwork for marginal agriculture was laid in the two decades between 1920 and 1940, in large part by the actions of the Canadian government and the railway companies. In the 1920's European immigrants were introduced to northern regions of which they were completely ignorant. In the 1930's dried out farmers from southern areas were directed to areas of better rainfall, again in northern regions (Kristjansen, 1947, p. 19). In this case they were supplied with government loans to enable them to relocate. The repayment of these loans maintained a severe shortage of capital in northern farming areas at a time when cash was necessary to change with a changing agricultural economy. Without doubt the advent of World War II helped many farmers to weather the economic storms which eventually caught up with them again in the 1950's.

The laws and government regulations under which the northern areas of the Prairie Provinces were settled also influenced the eventual nature of farming. The fact that early homestead regulations limited farm size without thought to soil, topography or weather has resulted in undersized uneconomic farms that are out of place in today's agricultural structure.

The type of farming carried on played a part. The tradition of wheat growing was established by early settlers from the Plains. In those days it yielded cash crop and self sufficiency was maintained

within the fence lines. Within the agricultural framework of the era of settlement, Lac La Biche was not a marginal farming area prior to 1936. However, changing technology and changing conditions of farming left the area and the people behind relative to other farming areas. As Schultz points out, poverty of whole communities did not generally exist under pioneering conditions because levels of living were essentially similar, even though people were often exceedingly poor by present day standards (Schultz, T.W., 1953, p. 156). The marked differences which have emerged between agricultural areas is not mainly the result of a deterioration on the part of those communities in which people are now living under conditions of poverty, but largely the consequences of the increases in per capita incomes of people in other areas. The inability to make a living wage off a farm, produces a marginal farmer.

CHAPTER IV

FARM INCOME

Although different indicators can be used to assess marginal farming, the criterion of whether a farm is viable or not is the amount of income derived from the farm. In the Eastern Canada Farm Survey, Menzies used this method and employed the following definitions to delimit his study (Menzies, 1965, p. 5).

Less than $2,500	--	non viable
$2,500 -- 4,999	--	viable
$5,000 -- and above	--	economic
$3,750	--	poverty line

In 1965, A.R.D.A. defined a low income or marginal farm as one which earned less than $3,750 from the sale of agricultural commodities during the previous year. The consensus of authoritative sources seem to stress gross income, with $3,750 as the point of marginality. Because the income categories in this thesis are slightly different from D.B.S. categories, $3,999, or less than $4,000 is the point of marginality.

Furthermore, this thesis is not concerned with the poverty or wealth of single farm families, but instead with the aggregate consisting of all the families in the study region or in districts within the study region. Therefore when reference is made to income it is the average level of per capita income within the community. The reason behind this is that not all farmers in a poor community are

necessarily poor, so that between community comparisons give better understanding of the problems involved (Schultz, T.W., 1953, pp. 152-155).

The gross farm income in 1967 for all farms in the Lac La Biche area averaged approximately $4,566. Therefore it would appear that the southern half of Improvement District 102 is not a marginal farming area using the criterion of $3,750 specified for marginality. Table 4.1 shows the distribution of gross farm income within the Lac La Biche study region.

Table 4.1

Distribution of Gross Farm Income Around Lac La Biche

Income Indices	Income Category in $	No. of farms	Percentage of sample
1	1-1,999	3	3
2	2,000 - 3,999	45	47
3	4,000 - 5,999	21	22
4	6,000 - 7,999	11	11
5	8,000 - 9,999	7	7
6	10,000 -11,999	1	1
7	12,000 -14,999	4	4
8	Over 15,000	4	4
-	No income	1	1
Total		97	100

Minimum $ 0
Maximum $ 15,000
Mean $ 4,566 approx.
Modal Class $ 2,000 - $ 3,999

Source: Fieldwork 1968

However, examination of Table 4.1 reveals that the modal income class which is under the point of marginality contains 49 of the 97 farmers in the study sample. These farmers represent 51% of the total, so that more than half the farmers in the Lac La Biche area are marginal and the owners of low production farm enterprises. The region can therefore be judged as a marginal farming area on this basis.

Distribution of Income

Within the study area, quality of income does not seem to form continuous areas of wealthy or poor farmers. Rather there are core areas with average incomes, plus areas with better than average incomes. These areas are surrounded by a scattering of low income farmers. Fig. 4.1 is constructed using the indices of gross farm income shown in Table 4.1. The index of income is plotted for every sample farm across the study area. As can be seen from the table, the lower the index number, the lower is the gross income from the farm and vice versa.

Some trends become obvious on studying the map. The Venice area has a long narrow belt of average income extending from the region of the lakes northwest of Hylo through the Venice district to Craigend south of Lac La Biche. The most common income in this area is in the $4,000-$5,999 category. South of Hylo is a node of better than average income, while around Caslan in the extreme west of the study area is a node of average income. These nodes are surrounded by low income farms.

The narrowness of the larger area discussed above is probably

a function of the grain farming which is predominant there. In addition, north and south of this area is country which has large tracts which are largely uncleared. The two nodes at Hylo and Caslan reflect newer settlement which is expanding outwards from the small hamlets of the same name. The lower income farmers scattered between these areas are a filling in process which is typical of what takes place between the main agricultural areas on a farming frontier.

Farms in the south and southeast of the Lac La Biche region form a large block of average to good incomes. On the periphery of this block is the usual scattering of marginal farms with concentration in the newer settlement areas around Helina in the extreme southeast of the study area. A small node in Twp. 65 Rg. 11 is located in the Green Forest Zone and represents farming which was present before the area was closed to settlement and also the occurrence of cattle leases on government lands. An area of very high income is located along the Beaver River around Briereville, and is again based on cattle rearing and government cattle leases.

Distribution of Income in Relation to Soils

Using the map of grey wooded soils in Chapter II, soil zones were marked on the income map 4.1. As discussed in Chapter II, the Lac La Biche region comprises a mixture of first and second class, second class, and third class grey wooded soils. The first two categories are arable, with care and proper farming practice, the third is potentially non arable.

Figure 4.1 indicates that the higher incomes were not achieved on the best soils around Lac La Biche. The higher incomes were

gained on the second class grey wooded soils southeast of Lac La Biche. In fact a sharp break in incomes can be detected in the Craigend area where the farm income index rises from four in the mixture of first and second class grey wooded soils to seven on the second class soils. The reason underlying this situation apparently, is that farmers in this area of poor soils and indeed more inhospitable topography for farming must follow a system that is adapted to the soils, topography and climate in the area. Crops suitable to rotational practices are grown and the economy leans heavily on livestock.

In the centre of this better income area a mixed farming economy prevails, while cattle ranching takes place on the periphery. Cattle and livestock have a better comparative advantage than any other form of farm enterprise on these soils. Because of this,high incomes prevail around Rich Lake in the northeastern part of Twp. 64 Rg. 11. This is an outlier of agriculture which has penetrated on to the non arable third class grey wooded soils. The farmers here achieve good incomes not only by adapting to the conditions but also by working large farm acreages.

The lower incomes returned on the mixed first and second class grey wooded soils seem to stem from the different agricultural emphasis in the northern and western part of the study area. Dependency on grain crops in the Venice-Hylo-Craigend areas (which is discussed later) seems to result in reduced farm incomes. The nodes of higher income south of Hylo and around Caslan on third class soils would appear to verify this. The Hylo node is generally a mixed farming area and records higher income indices than the Venice area, while

the Caslan node which is still in the pioneer stage of farming with not enough cleared land per farm to increase incomes achieves just as well as the Venice area because of a livestock economy.

Gross farm income in the Lac La Biche area is therefore influenced by location, especially locations which make it mandatory to follow a system which is attuned to the physical conditions of the area. It is also influenced by the crops grown, and better soils do not compensate for poor crop selection as far as farm income is concerned. In the economics of farming in the Lac La Biche region superior incomes can be achieved on very poor soils by employing good management techniques and proper crops. Conversely relatively low incomes result on better soils under the influence of poor management and a dependency on grain crops as the premier source of income.

Sources of Farm Income

To gain some insight into the sources of farm income, farmers were asked to estimate what proportions of their income was received from selected farm products. Across the study area farm revenue accrued from the sale of three main products -- grain, livestock and livestock products. No income was recorded from oil seeds or fodder crops. However, this does not indicate in the case of fodder crops that they were not grown, but rather that they were converted into beef products. The percentage of farm income from the various products is shown in Table 4.2 for the districts in the Lac La Biche area, together with the number of marginal farmers in each district.

Table 4.2

Percentage of Income from Various Farm Products.

Area	Grain Per cent	Livestock Per cent	Livestock Products Per cent	Farmers earning less than $4,000 Per cent
Craigend	41	56	3	20
Lac La Biche	50	42	8	62
Venice	61	25	14	44
Hylo	53	43	4	64
Rich Lake	14	84	2	38
Briereville	13	87	-	29
Normandeau/ Goose Lake	18	80	2	22
Helina	17	83	-	75
Caslan/Noral	16	81	2	47

Source: Fieldwork 1968.

Using these figures the Lac La Biche region divides itself into distinct types of farming areas. A cash grain growing area can be distinguished centering on the Craigend - Lac La Biche - Venice - Hylo districts, and a mixed farming area around Rich Lake, Briereville and the Normandeau-Goose Lake areas. Based on the percentage of low income farms who nevertheless emphasise livestock, a pioneer region can be identified around Helina and Caslan-Noral. A table of generalized type of farming areas can be constructed as follows (Table 4.3):

Table 4.3

Type of Farming Areas Around Lac La Biche

Area	Percentage income from cash grain	Percentage income from livestock	Percentage income from livestock products	Percentage of farmers earning ⩽ $4,000
I Cash Grain				
Craigend Lac La Biche Venice Hylo	51	41	7	54
II Mixed Farming				
Rich Lake Briereville Normandeau	15	84	2	31
III Pioneer				
Helina Caslan/Noral	17	82	1	67

As mentioned earlier and as shown in Fig. 4.1, cash grain farming does not return the income nor have the comparative advantage of mixed farming and livestock in the Lac La Biche area. The number of low income farmers (54%) in the cash grain region is only exceeded by the number (67%) in relatively new pioneer areas which have not developed fully as yet. In the mixed farming area the number of marginal farmers falls to 31% -- considerably lower than the Alberta provincial average for 1966 at 40% (1966 Census of Canada Vol. 2, Table 15, p. 15-3).

Non Farm Income

Non farm income appears to be inversely proportional to the amount of gross farm income. The average amount of non farm income in the study area was approximately $2,060 per capita for the 70% of sample farmers who worked off their farms. The distribution of non farm income is shown in Table 4.4.

Table 4.4

Distribution of Non Farm Income

Index	Income Category in $	No. of Farmers	Percentage of total
1	1 - 499	7	7
2	500 - 999	15	16
3	1,000 - 1,499	7	7
4	1,500 - 1,999	6	6
5	2,000 - 2,499	6	6
6	2,500 - 2,999	7	7
7	3,000 - 3,499	4	4
8	3,500 - 4,000	7	7
9	over 4,000	9	9
-	No off farm income	29	30
Total		97	100

Source: Fieldwork 1967.

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

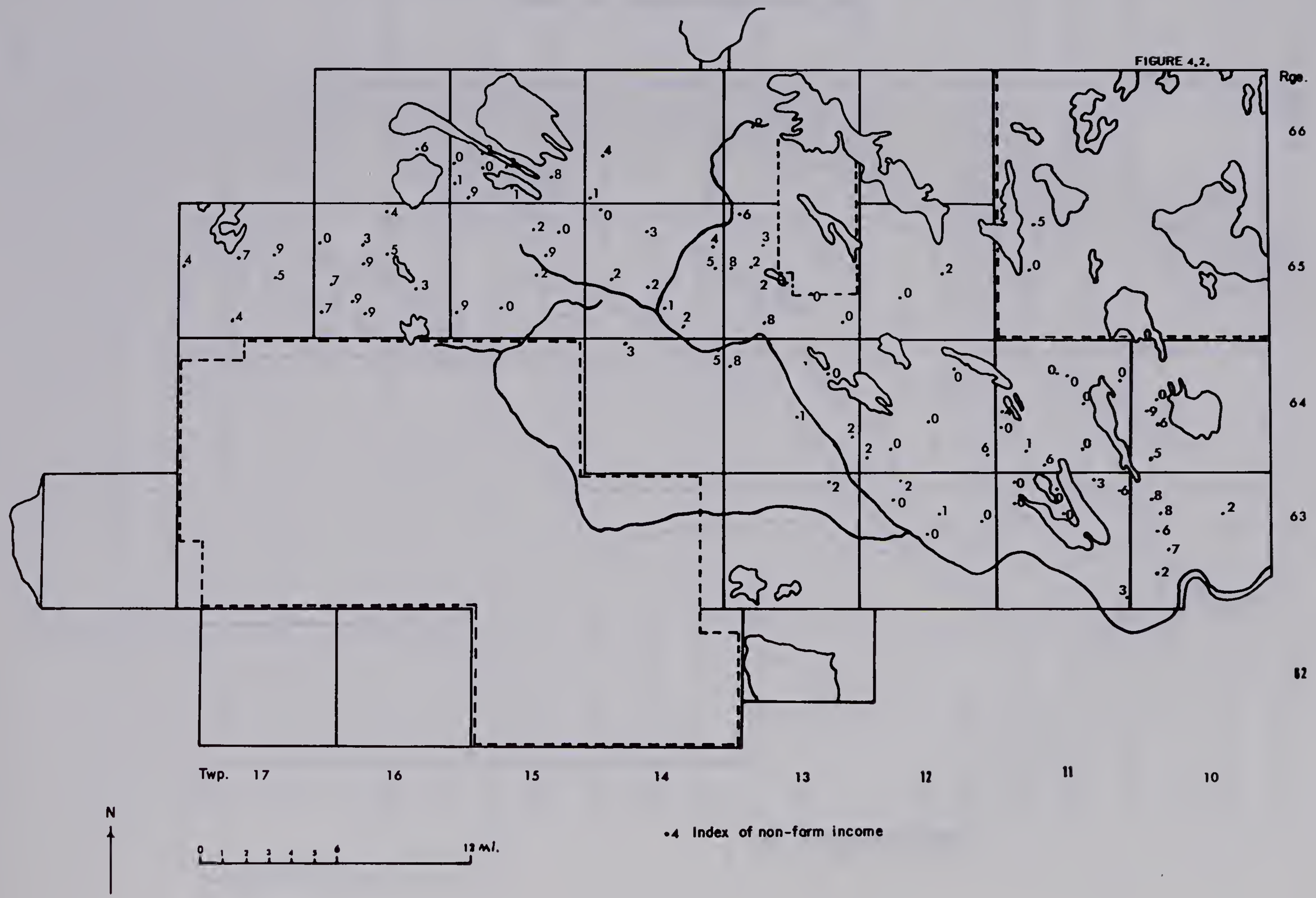
Using the indices in Table 4.4 non farm income was mapped (Fig. 4.2). As before, high indices denote high incomes and low indices denote low incomes. A further map was plotted (Fig. 4.3) by placing the gross farm income index for each farm on top of the non farm income index for the same farm. By this means a comparison was made. The map shows that in almost every case farms with low farm income have a compensatory high non farm income. These farms are most numerous on the fringes of the study area, Helina in the southeast and Caslan-Noral in the west being good examples of areas with a high degree of non farm income. Although it is not true in every case, farms producing high farm income rates tend to have no subsidiary off farm income. Between these two extremes is a wide variety of average farm incomes which are supplemented by moderate off farm earnings. Therefore middle numbers on both index scales tend to pair together. This is likely a function of the time available from the farm for off farm employment.

There are exceptions to these generalizations. Some low income farmers do not have any additional source of income. In general these farmers were married with families which induced lower job mobility and a reluctance to travel to sources of employment which were not in the immediate vicinity. Lack of employment opportunities within what was judged to be reasonable distance prevents these farmers from adding to family income. Some, when pressed, did admit doing farm work for neighbours, but this was repaid in kind.

On the other hand some farmers with moderate farm incomes worked off the farm, and in most cases received moderate remuneration.

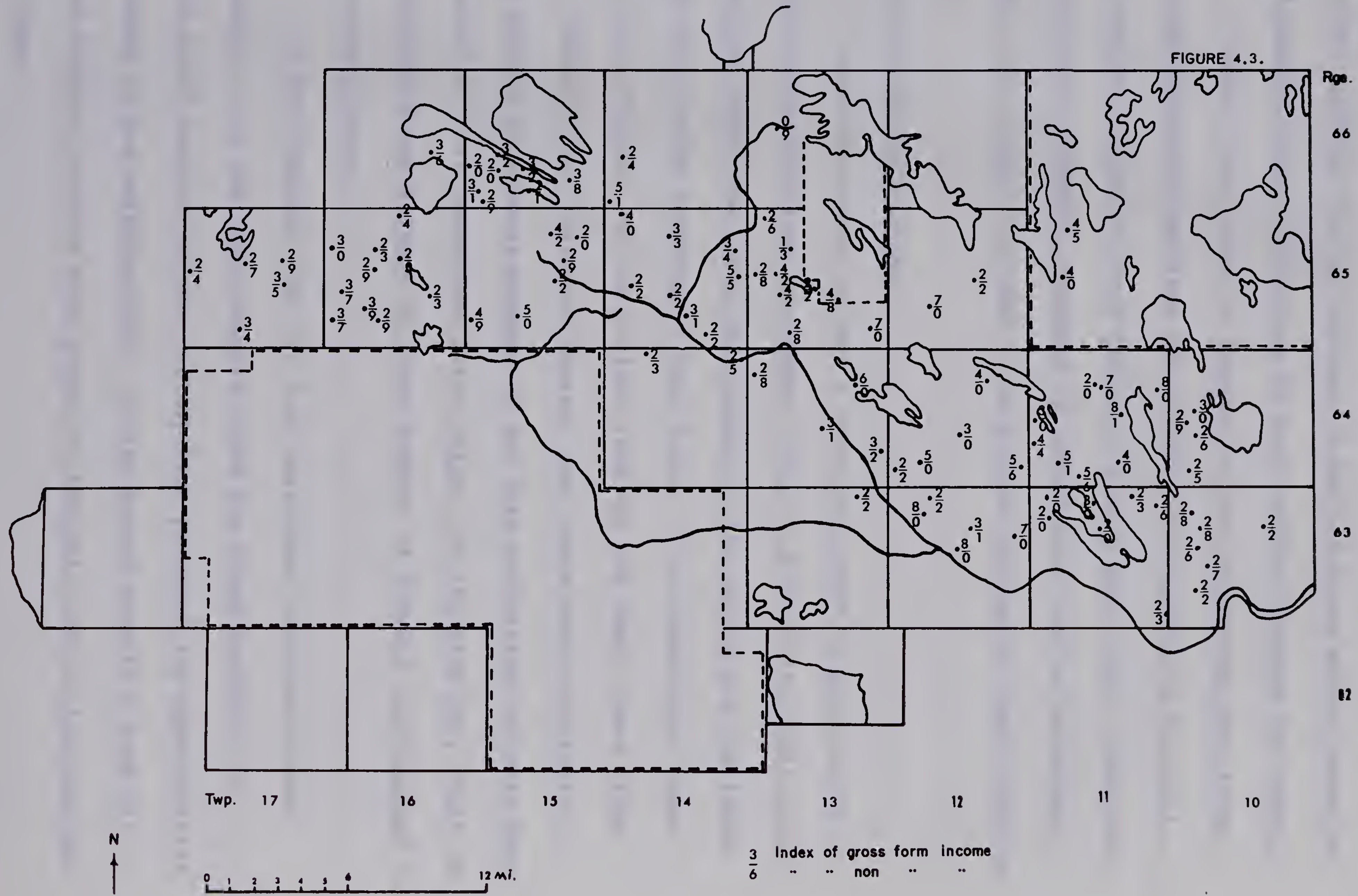
FIGURE 4.2.

NON-FARM INCOME



FARM V.S. NON-FARM -INCOME

FIGURE 4.3.



In each case ready access to one of the small towns or hamlets seemed to be the deciding factor, although a few did drive school buses or owned several which were driven by more marginal farmers for wages.

Within this group of farmers who are exceptions were those who owned threshing machines and did custom threshing in the fall. This yielded a high non farm income in a very short time. Some had switched from threshing machines to second hand combine harvesters, however, the former continued to be popular because of their very low cost.

Sources of Non Farm Income

Location appears to have a very large part to play in the availability of off farm employment. Fig. 4.2 shows the position of the sample farms, the towns and hamlets in the region and the index of non farm income received by each farm. It is immediately clear that in the vicinity of the railway line and the small towns along it -- Caslan, Noral, Hylo and Venice, that there were relatively large numbers of farmers engaged in non farm activities and also that the amount of this income was fairly high. In the same way, south of Lac La Biche along Highway 36, large numbers of farmers also engaged in non farm employment.

It was apparent that non farm employment and urban places go together. In the first example cited the close proximity of several small hamlets and the railway line provided job opportunities to farmers in the neighbourhood. In the second example a good all weather highway provided easy access to the main town of the area and urban jobs.

Isolation from urban places seemed to have a double influence on local farming. Strictly rural areas do not appear to have a job generative capacity and as a result there is no opportunity for off-farm employment. Associated with this lack of off-farm employment is the incidence of better farm incomes. The large mixed farming area southeast of Lac La Biche is an example of this phenomenon. This area which has no off-farm incomes (Fig. 4.2) also has the better gross farm incomes (Fig. 4.1). As discussed earlier, this mixed farming region forms a large block of farm land which is relatively isolated from any town or hamlet, so much so that even the non farm indices on its perimeter were very small. It would seem on this basis that marginal farming and off-farm employment have a cause-effect relationship which keep productivity and incomes at a relatively low level in each sphere of activity. If this is so, they would perpetuate each other.

At Helina, non farm incomes again assumed major proportions and were connected with the close proximity of the forest reserves and the availability of sources of additional income.

In the fringe areas one of the most popular sources of non farm income was school bus driving. This again was a function of location, the remoteness of the fringe areas and the distance to centralized schools. Other forms of off-farm employment were trapping and lumbering which took place during the winter months and which were really opportunity jobs which filled in a slack season. Highway and railway maintenance, trucking and forestry work also contribute to off-farm employment.

Income and Fertilizer

Areas of high, medium and low income have been identified together with the general type of agriculture carried on there. In order to gain some insight into farm practices, it was decided to examine the incidence of fertilizer use and its effect on farm incomes. To accomplish this the indices for farm income were plotted and a similar index for the use or non use of fertilizer plotted beside them (Fig. 4.4). In this case, 1 stood for use, 2 for non use and 3 used sometimes.

The farms using fertilizer form an area with approximately the same spatial dimensions as the mixed farming area (Figs. 4.4 and 4.1). All farmers with average or higher than average farm incomes (average income is index 3) used fertilizer irrespective of district, soil group or type of farming. However, while the mixed farming area maintained its identity with almost the same shape between income (Fig. 4.1) and fertilizer use (Fig. 4.4), the cash grain area became smaller, broken up and did not retain its shape or spatial dimensions.

Several trends and conclusions became apparent when fertilizer use was compared to farm income.

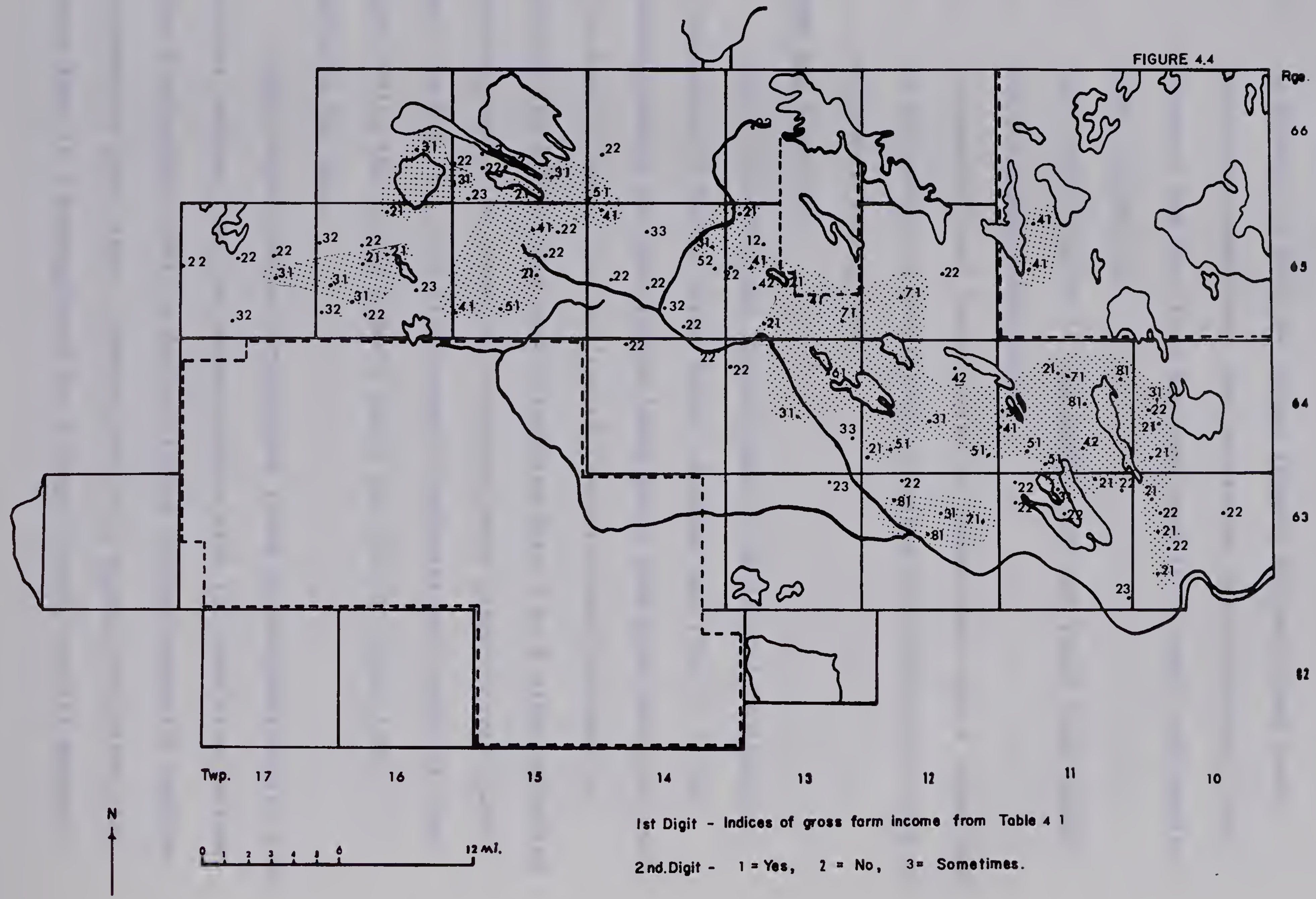
(1) Some low income farmers used fertilizer, but the large percentage did not.

(2) Any farmer who did not use fertilizer did not achieve an income above average, and in most cases was marginal.

(3) Fertilizer use was more in evidence on the poorer quality second class grey wooded soils than on first class grey wooded soils. In fact a large gap is visible in the main

GROSS FARM INCOME AND USE OF FERTILIZER

FIGURE 4.4



1st Digit - Indices of gross farm income from Table 4 1

2nd.Digit - 1 = Yes, 2 = No, 3 = Sometimes.

cash grain region where fertilizer did not appear to be used to any great extent.

(4) In general it was low income farmers who said they used fertilizer sometimes. The impression received during field research was that they may have used it -- once, but usually never did use it.

(5) Only three farmers in the sample (3%) had their land tested for fertilizer application.

(6) It appeared that the majority of farmers had only a vague idea of the amount of fertilizer to spread with particular crops on different soil groups.

Income and Farm Size

Better than average incomes seem to be directly related to the ownership of fairly large farms. Another map (Fig. 4.5) was produced showing the farm income index and a farm size index for each of the sample farms. The indices of farm size were obtained by numbering the D.B.S. farm size categories from 1 to 8 after excluding everything under 160 acres and combining every category over 2,240 acres. On Fig. 4.5, the first numeral indicates the amount of farm income, while the second numeral shows the size of owned land comprising the farm.

High income indices were always found in combination with high farm size indices, and low income indices with low farm size indices. It was also evident that "moderate" income indices generally combine with moderate farm sizes. However, while it seems conclusive that a large farm is a prerequisite for a large income, not all farmers

seem to be getting maximum return from their land.

When farm size and farm income indices within a physically similar region are compared an indication of relative farm efficiency can be obtained. By comparing groups of farms the relative efficiency of a farming area can similarly be obtained in at least a crude fashion

When a farm records a higher income index than a farm size index, e.g. 7.5 indicates that the farm is operating more efficiently than a farm which is rated 5.5. On the other hand a farm rated 2.5 is not operating efficiently and is returning a lower income relative to the investment in land than the first example. Farms of the latter type generally are operating under one or all of several handicaps.

(1) The farmer is inefficient in the management of his land area.

(2) The farmer is growing crops which do not yield maximum profit under existing economic or physical conditions.

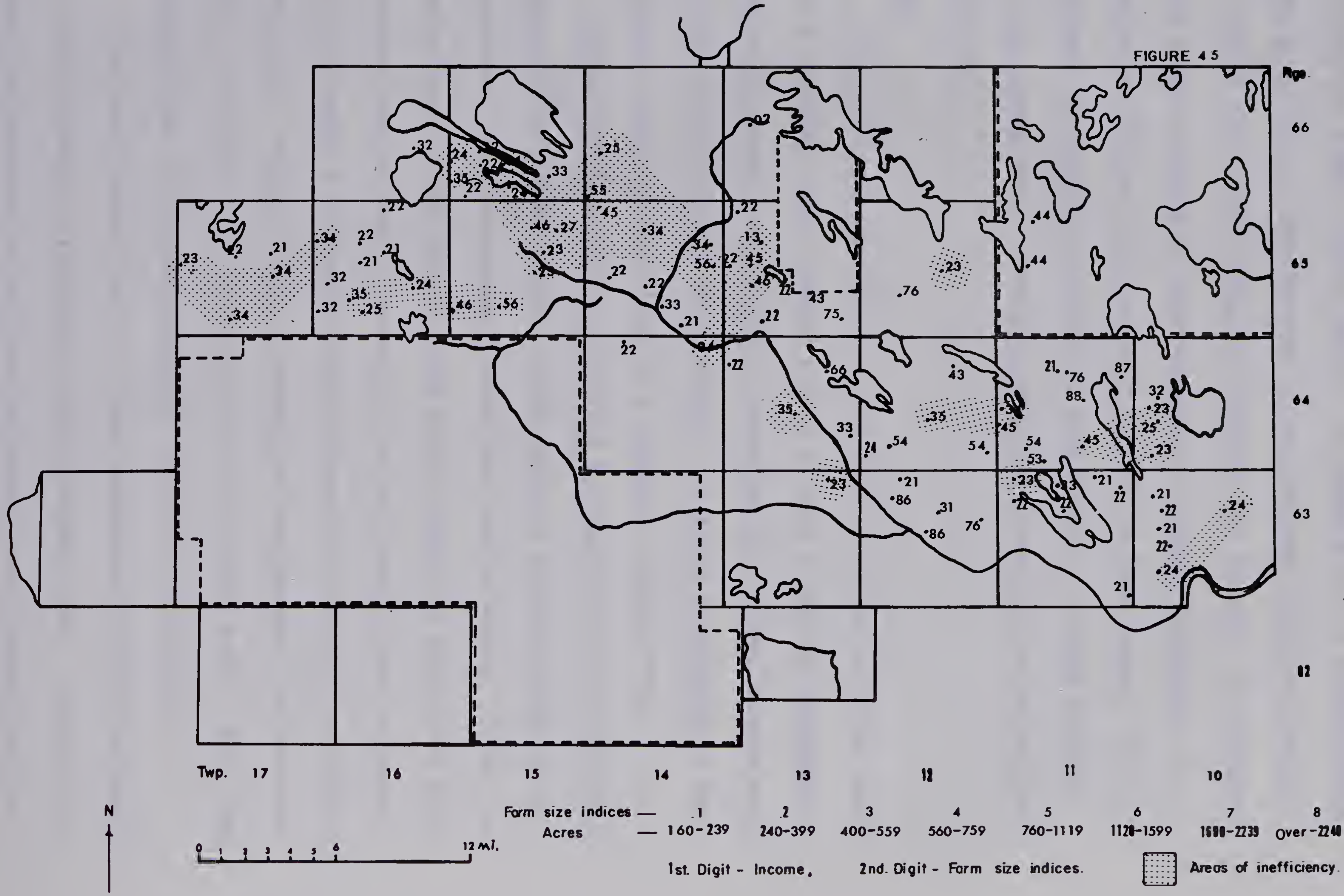
(3) There is a large amount of uncleared and unbroken land on the farm relative to the productive area of the farm.

Using this measure the spatial dimensions of inefficiency (or efficiency) can be plotted. Because this thesis is concerned with marginal farming, inefficiency was the dimension selected and plotted (Fig. 4.5). Areas of inefficient land use or lower incomes relative to farm size were found all across the study region.

The cash grain area centering on the Venice - Hylo - Craigend districts, and the pioneer areas around Caslan - Noral and Helina show a high incidence of low returns compared to farm size. The mixed farming area on the other hand reveals a minor amount of this type of farm situation. Comparing the situations existing in the cash grain

FIGURE 4.5

AREAS OF INEFFICIENCY



Farm size indices —	1	2	3	4	5	6	7	8
Acres —	160-239	240-399	400-559	560-759	760-1119	1120-1599	1600-2239	Over-2240

1st. Digit - Income, 2nd. Digit - Farm size indices.

Areas of inefficiency.

region and the mixed farming region, it appears that a predominance of cash grain in the farm economy is not the most efficient use of farm land if the farmer wishes to maximize his income. In the same fashion large acreages of uncleared bush on farms, especially in pioneer areas did not contribute in any way to farm income. While this aspect has not been studied in this thesis, it seems possible that farm income varies inversely with the acreage of uncleared bush on the farm.

Summary

Using the average gross income figure the Lac La Biche region is not a marginal area. However, this is only a partial assessment, because when income distribution is examined 51% of the farmers earn less than $4,000 annually from farming. It seems reasonable to conclude that in fact Lac La Biche is a marginal farming area.

This contradiction is explained by examining districts within the region on an income basis. Three types of farming areas can be distinguished using percentage income from farm products. First, on the better grey wooded soils a cash grain economy in which over half the farmers are marginal. Secondly, a mixed farming area on second class grey wooded soils where better incomes are recorded and which is not marginal. Thirdly, pioneer farming on the periphery of the main regions, but concentrated on third class non arable soils. This type of farming tends to be overwhelmingly marginal in character.

Low farm incomes lead to a high dependency on off-farm employment, and an inverse relationship exists between them. During field research the necessity of off-farm employment was stressed, but on

the basis of the statistics it would seem that there is a cause and effect relationship between off farm employment and low farm incomes. The areas which contained a large percentage of marginal farmers were highly subsidised by wages from off farm jobs but were also conveniently located in respect to urban places and job opportunities. The non marginal area was relatively isolated from urban places, and the farmers who were not as favourably located in respect to towns and villages generally did not have off farm employment. They also achieved better incomes from farming. It could be that it is still impossible to serve two masters.

Examination of fertilizer use revealed that the farmers who adopted fertilization programmes were generally not marginal. However, this could be a function of the more advantaged farmers' ability to buy fertilizer and the low income farmers' lack of capital, this aspect was not examined. Finally, farmers who had average or above average farm incomes also had larger than average farms.

CHAPTER V

FARM STRUCTURE

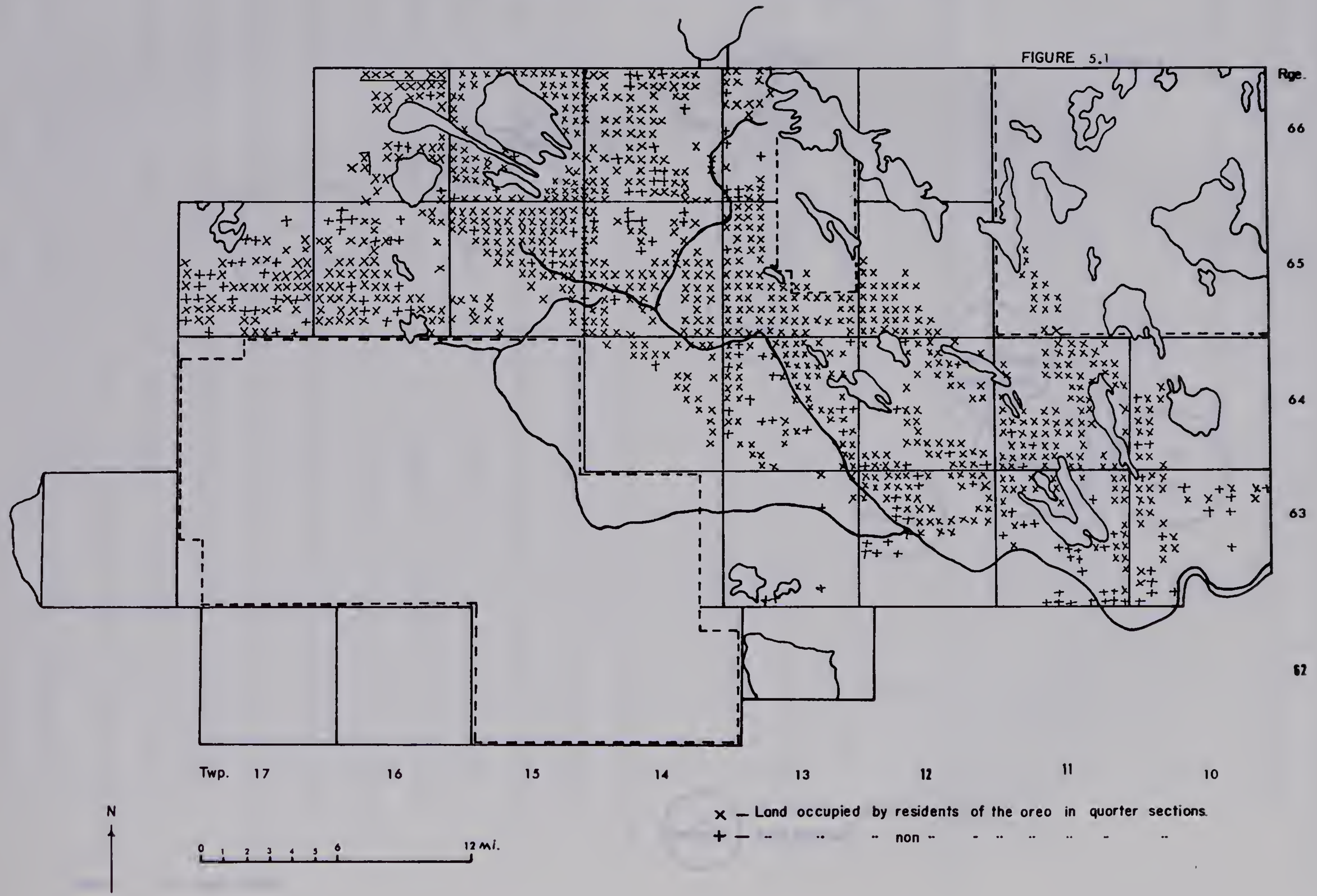
The direction and extent of farming around Lac La Biche reflects cultural and physical barriers. Culturally the presence of the Metis colony, the Indian Reserve and the Forest Reserve or Green Belt delimit the direction and eventual maximum size of farm settlement. A band of farmland can be distinguished trending in a northwesterly direction from Helina through Craigend to Hylo and Venice. An additional arm extends southwestwards from Hylo to Noral and Caslan. The extent of owned farmland by quarter section is shown on Fig. 5.1. In later discussion in this chapter farms have been assigned to districts on the basis of their postal addresses (Fig. 5.2).

Physically the different classes of grey wooded soils impose rigid limitations. Although a finger of agriculture has penetrated the potentially non arable soils in the eastern part of the area, and most of these soils towards Caslan in the west have been occupied, the main area of farming is confined to the mixed first and second and second class forest soils in a northwest - southeast direction through the centre of the area. The Lac La Biche study area contains approximately 576,000 acres of land. Of this total less than one third (180,320 acres) was in farms in 1968. The remaining two thirds is unoccupied wild land under the control of the Crown.

At a financial level, farming operations ranged from subsistence to large commercial operations. Farm programs at all levels usually

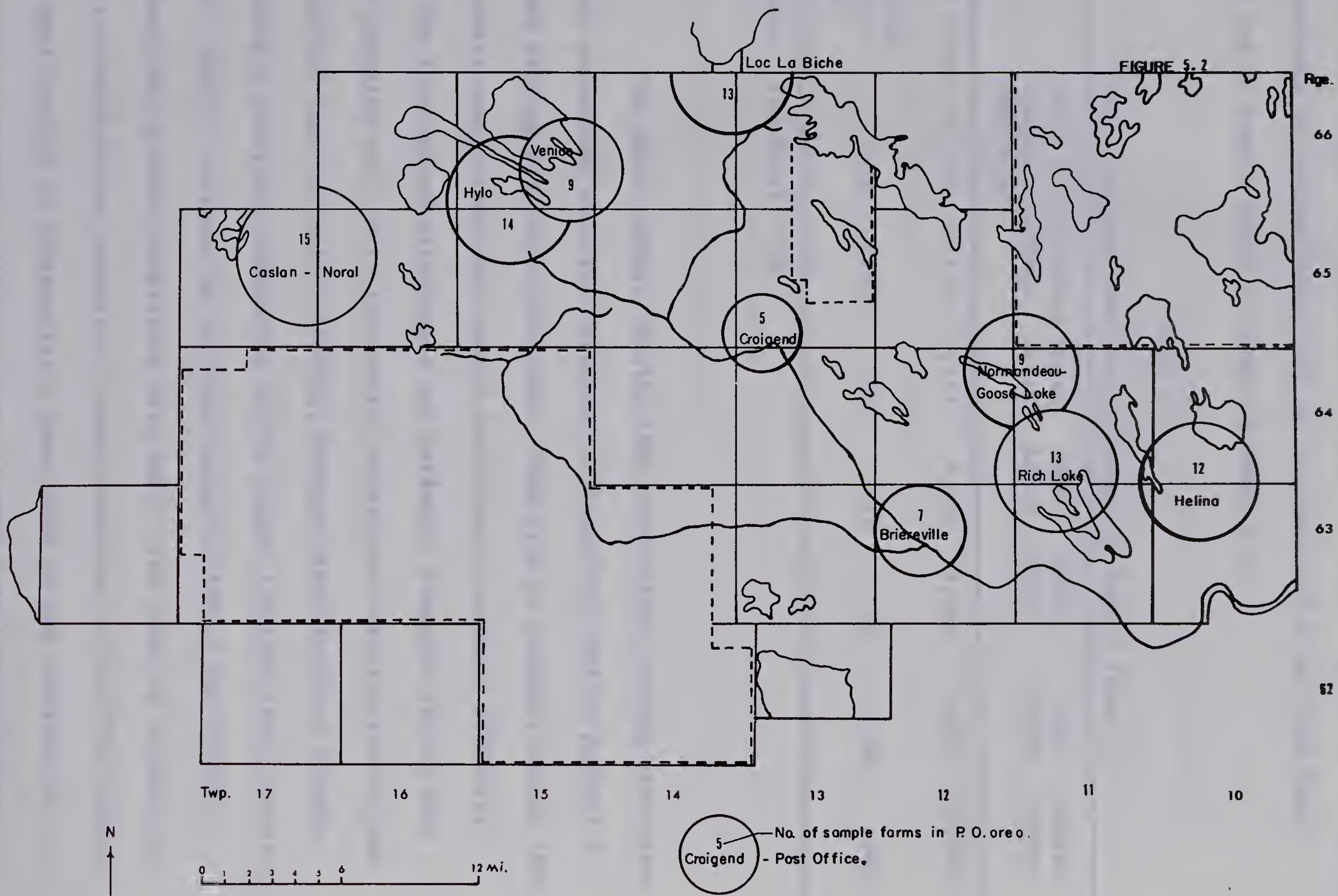
LAND OCCUPIED AROUND LAC LA BICHE

FIGURE 5.1



SAMPLE FARMS BY POST OFFICE DISTRICT

FIGURE 5.2



Source : P.O. Guide 1968.

combined cash grain crops with feed grain and levestock. The relative importance of various crops both on an areal and a per farm basis for the 97 sample farms is shown in Table 5.1.

Table 5.1

Total and Per Farm Crop Acreages of Sample Farms.

	Total Sample farm area	Cultivated Acreage	Wheat Acres	Oat Acres	Barley Acres	Hay Acres	Forest Acres
All farms	61,180	27,720	3,211	6,894	3,624	14,043	33,460
Average per farm	630	285	33	71	37	144	345

Source: Fieldwork 1968.

The local farmers realize that diversified farming with livestock production and crop rotations is necessary, and in general a mixed farming program is followed. This type of program, rather than a purely specialized one, should have brought economic stability to the area but maladjustments are evident. Research in the area has revealed that small farm units, widespread distribution of poor soils and lack of capital combine, amongst other factors, to make farming a hazardous enterprise in the region (Jansson,1965, Schultz, W.M., 1966). Reliance on off farm income by 70% of the farmers around Lac La Biche underlined this fact. The level of prosperity, as indicated by the numbers of farms classified in the 1966 Census as small scale, is substantially lower than in the province of Alberta as a whole - 51% with gross incomes less than $4,000 as

compared with 40% for Alberta. The Alberta percentage includes farms under 160 acres, which have been excluded from the present study.

Farm Size

The question of farm size looms large in the ideological controversy over how agriculture should be organized. Strongly held beliefs about the "proper" size of farms make it difficult to examine this question without introducing personal value judgements, or incurring the risk of being misunderstood. As Schultz (1964, p. 111) pointed out, turning to the concept of "returns to scale" is not usually very meaningful because the development of agriculture always entails the introduction of additional new agricultural factors. This in turn creates a process in which the major item is not one of size, but factor proportionality.

A further problem presents itself in any discussion on farm size. An overall lack of definition of what constitutes a farm leads to a general lack of agreement on what is the average farm size in any area. Canadian census data cover all land holdings greater than one acre in extent and selling more than $50 of produce annually. There is no denying that one or two acres in the immediate vicinity of Lac La Biche can sustain a highly profitable mink ranch, but it is doubtful if the District Agriculturist's office looks on this as an agricultural enterprise or even counts it as a farm although the Census does. The result is that farm size in the Lac La Biche area is a subject upon which several surveys (including the Census by D.B.S.) have been carried out and on which none of them agrees. It is the writer's opinion -- reflected in the format of the

questionnaire for this thesis -- that farms in any region of the world have optimum, minimum and maximum sizes depending upon the input mix or farm program. This input mix can change the form of agriculture from extensive to intensive with resulting reduction in land area of the farm. However, in the Lac La Biche area, under the form of agriculture carried on there in 1968, 160 acres was judged to be the minimum gross size of owned farmland which could constitute a farm. Subsequent statistics reflect this point of view that anything less than a quarter section cannot be considered a viable farm unit on the Canadian Prairies. Rented or leased land is not counted in any discussion on farm size, the reason being that these can vary from year to year and are not constants. Rented and leased land will be discussed under the heading of Land Controlled.

The most commonly expressed opinion regarding the Lac La Biche region is that the economic development of the area is dependent upon farm size and in general the farm sizes within the area are too small. A survey of farm size around Lac La Biche in 1967 found that the average size of farm was approximately 440 acres with an estimated 194 acres (44%) cultivated. The 1966 Census showed that the average farm size was 520 acres with 210 (40%) cultivated (Census of Canada, 1966, Vol. 2, p. 27-4, 28-4).

In the study sample the average size of farm was 630 acres with 285 acres (45%) improved. The structure of the farm sample probably accounts for this larger farm size as farms under 160 acres were ignored. The frequency distribution of farms by total area in the sample is shown in Table 5.2.

Table 5.2

Frequency Distribution of Farms in Sample by Total Area.

Census Categories	160-239	240-399	400-559	560-759	760-1119	1120-1599	1600-2239	Over 2240
No. of farms	11	23	16	20	13	10	3	1
Maximum size	160	320	540	660	960	1440	1760	2720
Average size	160	316	480	637	867	1260	1706	2720

Source: Fieldwork 1968.

The average size of farms within the sample was larger than the average farm sizes in K.D. 102 or C.D 12 again reflecting the deliberate structure of the study sample. However, the average is smaller than the provincial average of 705 acres. Figure 5.2 shows diagrammatically the relative sizes of the average farm in Alberta, C.D. 12, I.D. 102 and the study sample.

Closer examination of farm size in regard to the relative size distribution of farms shows that most farms are clustered in the two quarter category, not only in the study sample, but also in Alberta and in Improvement District 102 as shown in Table 5.3 and Figure 5.2.

FIGURE 5.3

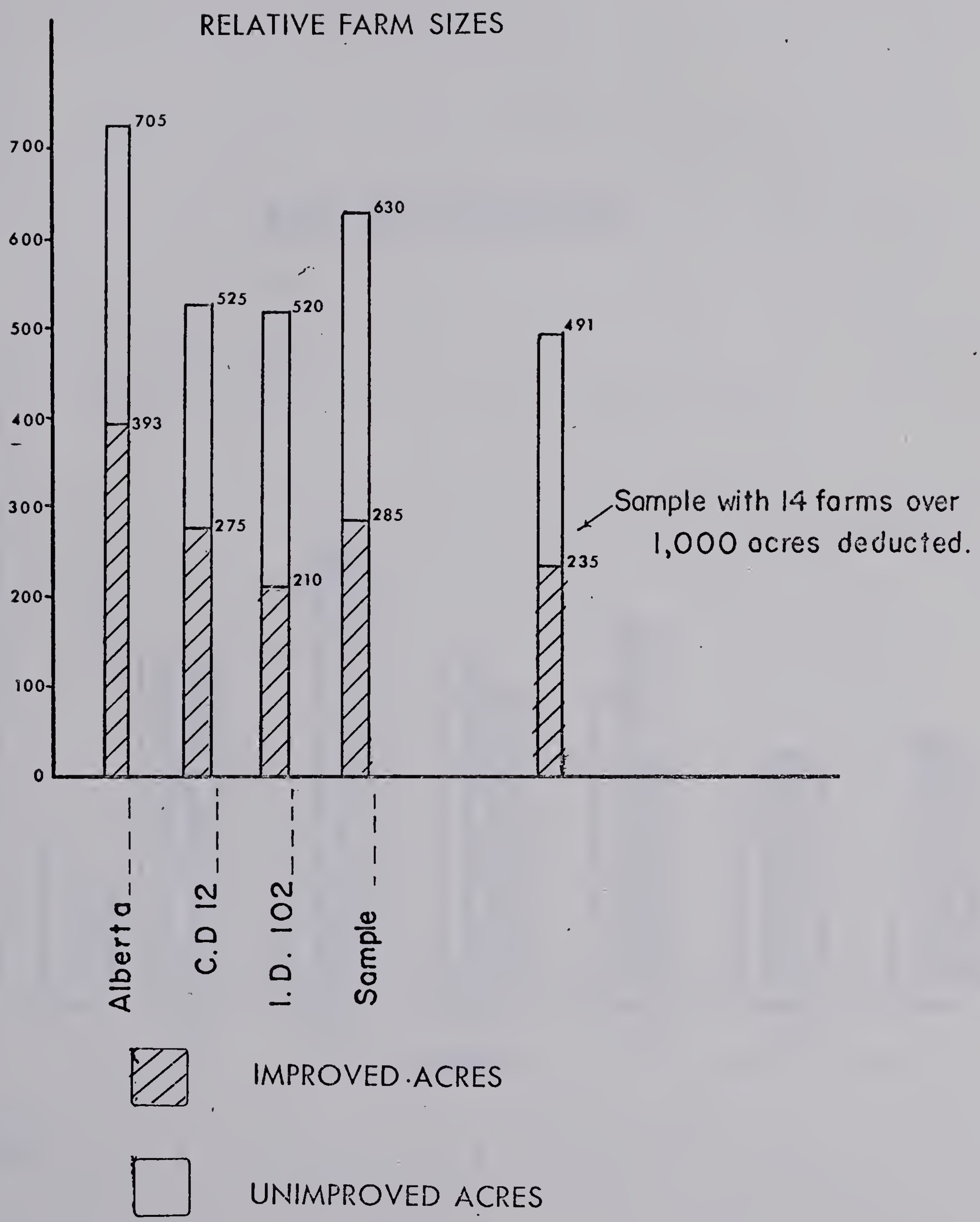

RELATIVE FARM SIZES
700
600
500
400
300
200
100
0
705
393
525
275
520
210
630
285
491
235
Sample with 14 farms over 1,000 acres deducted.
Alberta
C.D 12
I. D. 102
Sample
IMPROVED ACRES
UNIMPROVED ACRES

FIGURE 5.4

FARM SIZE DISTRIBUTION

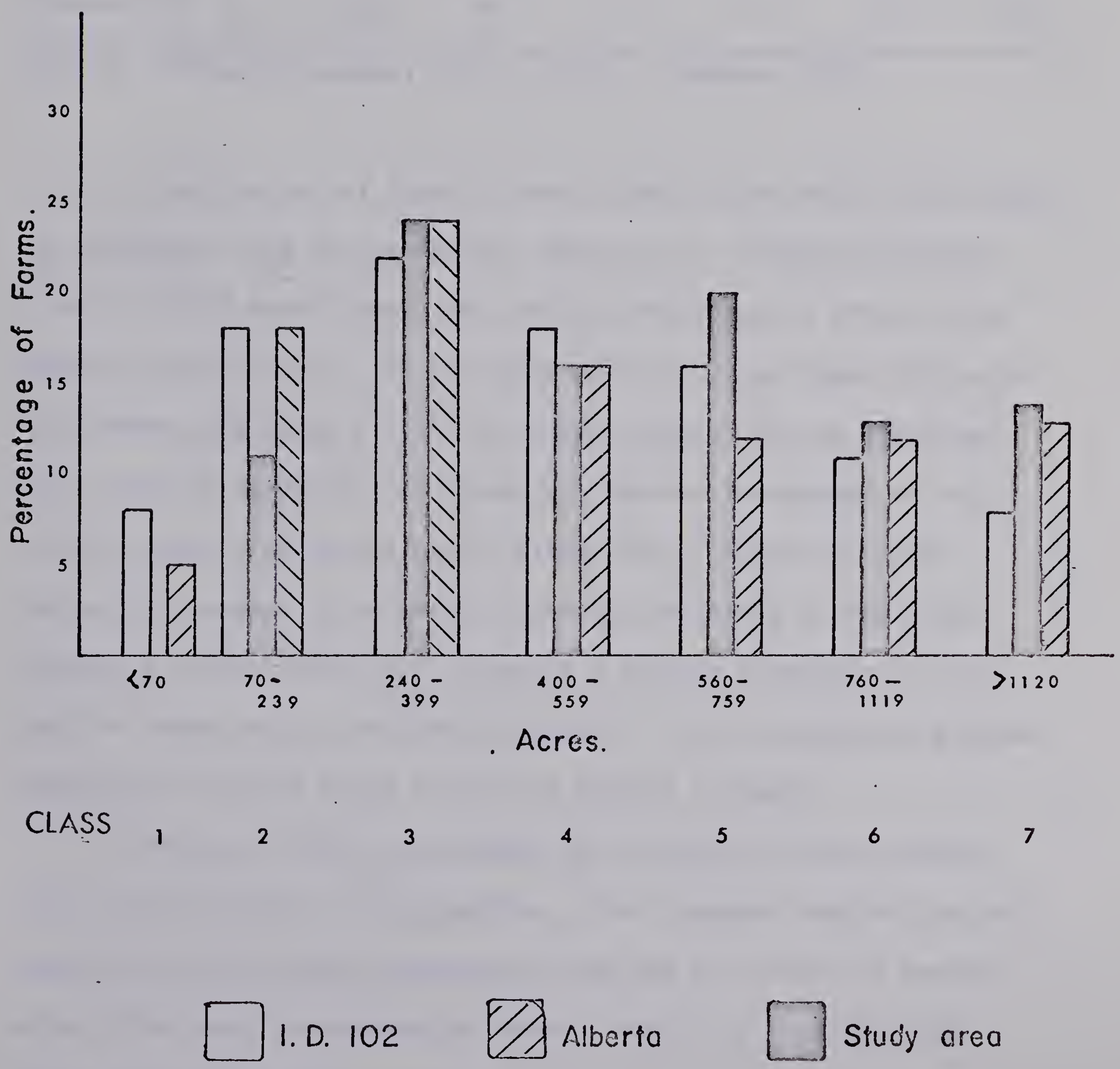


Table 5.3

Relative Distribution of Farms

Class	1	2	3	4	5	6	7
Acreage Classification	Under 70	70-239	240-399	400-559	560-759	760-1119	Over 1120
Sample (%)	-	11	24	16	21	13	14
I.D.102 (%)	8	18	22	18	16	11	8
Alberta (%)	5	18	24	16	12	12	12

Source: Census of Canada, Vol. 2, 1966. Fieldwork 1968.

Distribution of farms by size class is the same in the sample as in Alberta with two exceptions (Table 5.3). These are Classes 1 and 2 (0-239 acres) where the smaller percentage of farms in the sample is again due to its structure with all farms under 160 acres eliminated, and Class 5 (560-759 acres) which cannot be explained other than by assuming that there is a greater percentage of one section size farms around Lac La Biche than in Alberta. This assumption appears to be correct, because according to the D.B.S. figures for 1966 (Table 5.3) there is a greater proportion of one section farms in I.D. 102 than in Alberta. In all cases the greatest proportion of farms falls in the two quarter category.

Because of this the average of 630 acres per farm around Lac La Biche tends to be misleading. Such averages obscure the much larger size of the more prosperous farms and the very much smaller size of the more representative farms. Table 5.4 separates the large farms within the sample.

Table 5.4

Farm Size Within the Study Sample.

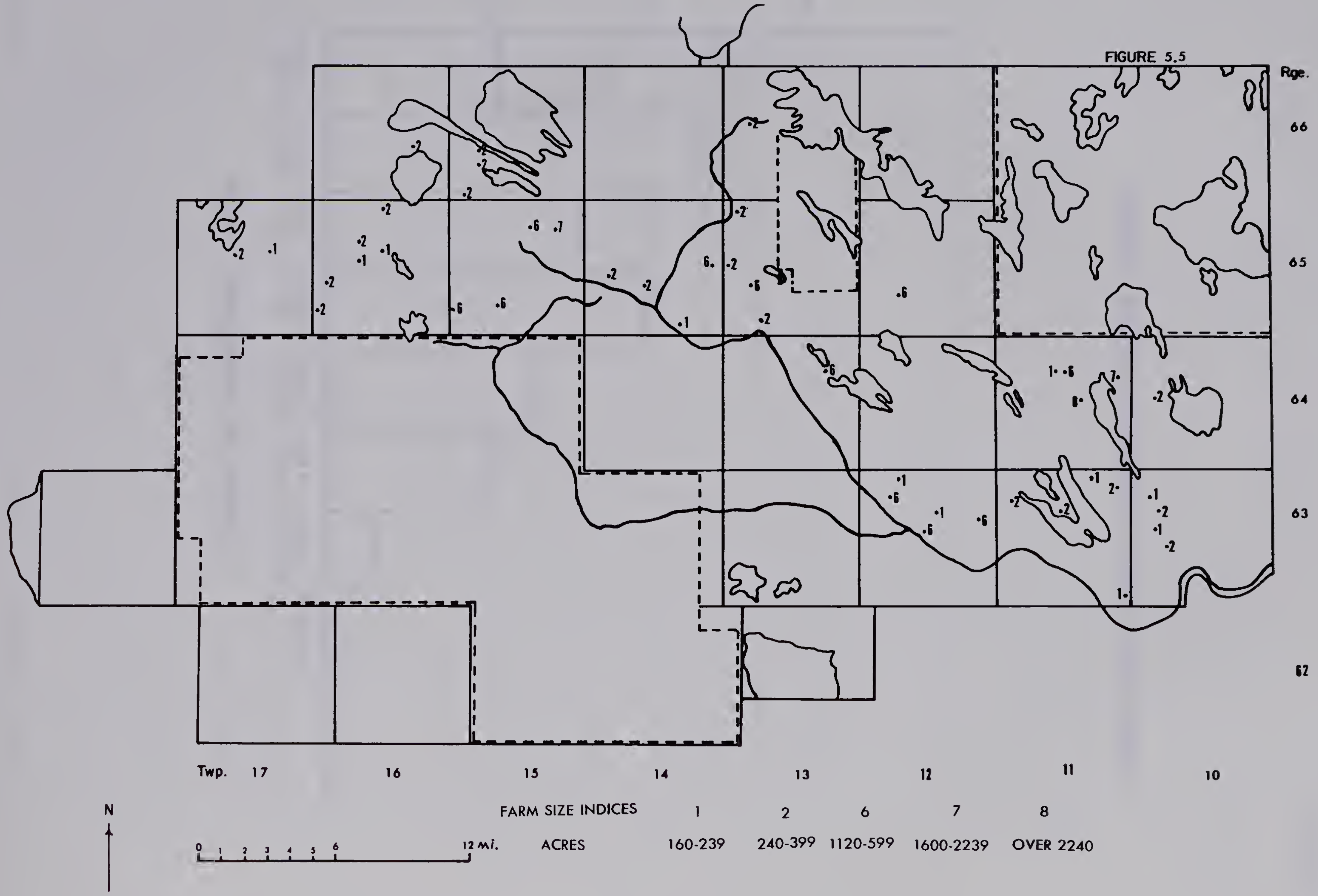
No of Farms	Average size per farm	Percentage of Sample	Total Acreage	Percentage of Total Acreage
97	630	100	61,180	100
14	1,460	14	20,440	34
83	491	86	40,740	66

Source: Fieldwork 1968.

While the 97 farms within the sample had a total acreage of 61,180 acres with an average farm size of 630 acres, one third of the total acreage (34%) was accounted for by only 14 farms with an average size of 1,460 acres each. Four of these 14 farms were located in the cash grain area and the remainder in the mixed farming region with a concentration towards the boundary with the pioneer lands (Fig. 5.5). The remaining two thirds of the land within the sample contained 83 farms (86% of the sample). These 83 farms had an average size of 491 acres (Fig. 5.3) giving a more accurate indication of current farm size. Thus it was established that the average farm size is maintained at a high level only by the inclusion of a few very large farms. It now became necessary to examine the smaller farms, specifically the category of less than 400 acres. A further break-down of farms for the complete sample is shown in Table 5.5 while Fig. 5.6 shows a histogram of size categories.

FIGURE 5.5

LOCATION OF 14 FARMS BY SELECTED SIZES



FARM SIZE INDICES	1	2	6	7	8
ACRES	160-239	240-399	1120-599	1600-2239	OVER 2240

FIGURE 5.6

SAMPLE FARMS BY CENSUS SIZE CATEGORIES

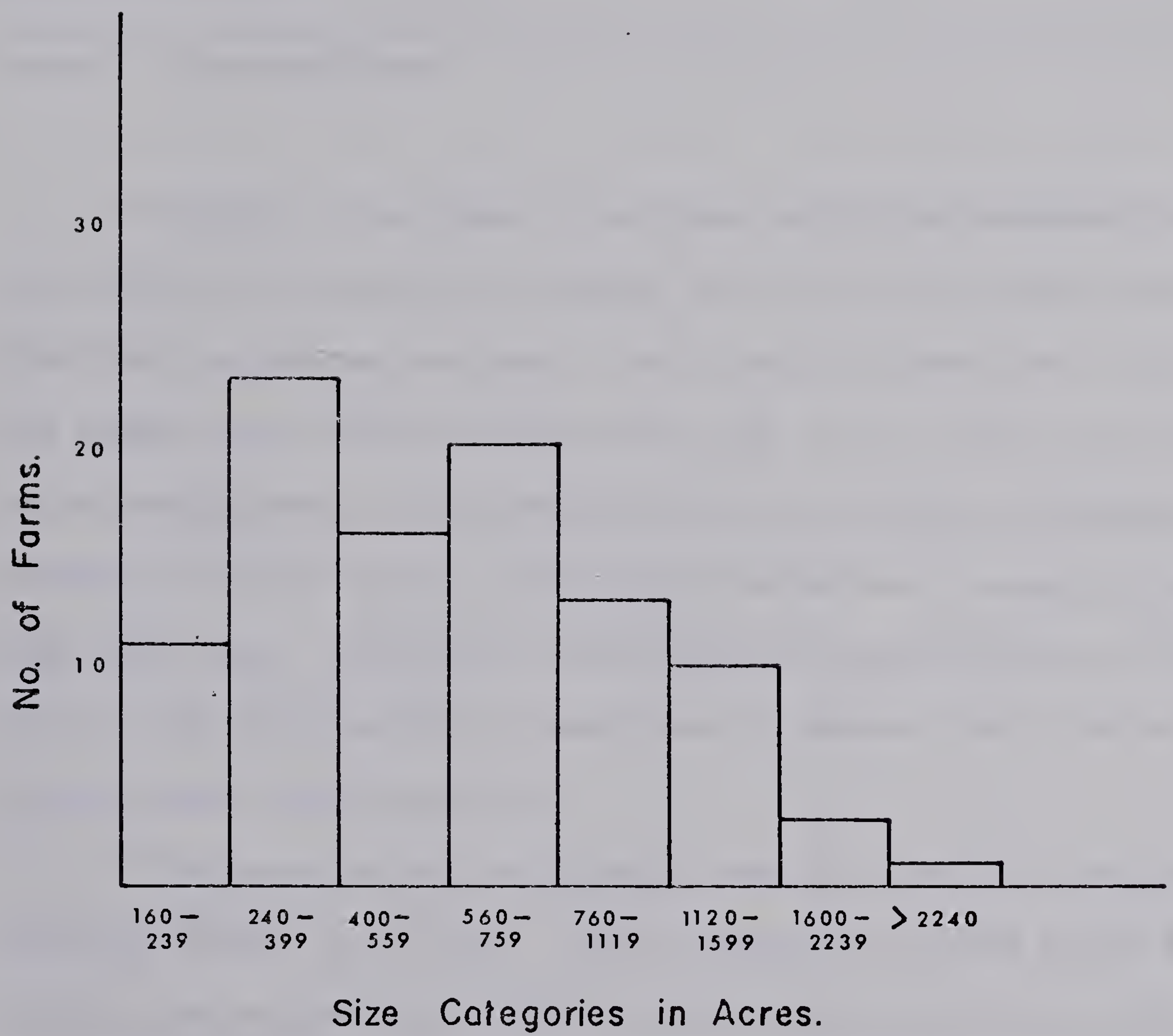


Table 5.5

Classification of Sample Farms.

Group	Percentage of farms	Percentage of Total Area	Average size of farm
Upper (over 1,000 acres)	14	34	1,460
Lower (under 400 acres)	34	13	265
Middle (400-1,000 acres)	52	53	661

Source: Fieldwork 1968

The 34% of the farms at the lower end of the hierarchy own only 13% of the land with an average farm size of 265 acres, that is, less than two quarter sections. The location of these small farms was mapped using indices of farm size (Fig. 5.5). While they tended to be concentrated in the pioneer zones on the eastern and western boundaries of the region, a substantial number were located in the cash grain area. The mixed farming area was relatively free of small farms. The remaining 52% of farms have an average size of 661 acres--slightly more than one section.

Farm sizes in the Lac La Biche area are similar to the mean sizes for Alberta as a whole. On this basis the incomes should be similar, but as indicated earlier, farm incomes around Lac La Biche are very much lower than the Alberta average. The difference in incomes stems largely from differences in cultivated acreage. Near Lac La Biche there is a greater probability of having farms with relatively large total acreages but with small acreages of improved

land than in the province as a whole. The difficulty and expense of clearing new land in the Lac La Biche region accounts for these small cultivated acreages, also the shorter time of settlement than elsewhere.

Cultivated Land

A study was conducted by the District Agriculturist's Office in Lac La Biche in 1967 for the Alberta Department of Agriculture to find the amount of cultivated land on farms in the Lac La Biche region. Four hundred and sixty two people who owned land in the area were questioned and 425 replies received. The tabulated results of this investigation are shown in Table 5.6, and compared with similar data from the writer's sample.

Table 5.6

Cultivated Acreage.

Farm Size	Lac La Biche 1967 Number	Lac La Biche 1967 Percentage	Sample 1968 Number	Sample 1968 Percentage
Less than 160 acres cultivated	199	46	19	20
160-249 acres cultivated	104	25	30	31
250-499 acres cultivated	104	25	30	31
More than 500 acres cultivated	18	4	18	18
Source: Unpublished figuresobtained from District Agriculturist, Lac La Biche, September 1967.			Fieldwork 1968.	

Although farms vary greatly in size, the majority have less than 250 acres under cultivation.

Table 5.7

Cultivated Acreage Lac La Biche Sample Farms 1968.

Farm Size	Number	Percentage	Average Size
Under 70 acres	5	5	50
70-159	14	14	128
160-239	30	31	195
240-399	30	31	292
400-559	9	9	414
Over 560 acres	9	9	755

Source: Fieldwork 1968.

In the sample the cultivated acreages vary widely from 0 to 755 acres. Of the five farms tabulated as having under 70 acres cultivated only one had any cultivated acreage. The other four consisted of one honey farm and three farms selling wild hay. It can be seen that 50% of the farms had less than 240 acres under cultivation. This figure is not as large as the 71% for the Department of Agriculture survey shown in Table 5.6, but once again the bias of the sample in eliminating farms under 160 acres has reduced the proportion. Even with these small farms eliminated 50% still represents a substantial number of farms with a small cultivated acreage. Because of this large number of farms with less than 250 acres cultivated an attempt has been made to analyse these more fully, and the study area has been divided into nine smaller farming districts as explained earlier (p. 84, Fig. 5.6). The Lac La Biche

study area has been settled almost entirely through homestead sale and lease agreements administered by the government of Alberta. Consequently the size of holdings has been fairly uniform in all districts because of homestead regulations. Table 5.8 shows the farm structure in each of the nine districts within the Lac La Biche study area.

Table 5.8

Farm Size and Cultivated Land in Sample Farms by Districts.

District	Average size of farm in acres	Average cultivated acres per farm	Percentage of total area cultivated	Percentage of farms with 160 acres or more cultivated	Percentage of farms with 50% or more farm area cultivated	Percentage of farms with less than 250 acres cultivated
Venice	569	261	46	89	56	11
Craigend	784	370	47	80	20	20
Hylo	716	270	38	100	29	43
Lac La Biche	589	251	43	62	54	54
Briereville	710	434	61	71	71	43
Rich Lake	535	249	46	77	38	61
Normandeau/ Goose Lake	1,051	462	44	89	44	33
Helina	380	185	49	75	50	83
Caslan/ Noral	544	248	46	87	60	53

Source: Fieldwork 1968

Some of the more important points brought out by analysis of Table 5.8 are:

(1) Cultivation had reached its greatest extent in the mature districts within the region where early settlement took place and where cash grain farming was now the main source of income, -- for example Craigend and Venice.

(2) The two pioneer districts had the smallest cultivated acreages with almost half the farmers having less than 160 acres cultivated -- for example Helina and Caslan.

(3) The overall frontier nature of the area, with more than half the total land still uncultivated or unimproved, is clear.

More than 80% of all farms in three of the cash grain districts have at least 160 acres under cultivation. These districts also have the smallest percentage of farms with less than 250 acres cultivated. The fact that two of these districts, Craigend and Hylo, had only 20% and 29% respectively of farms with more than half their land cultivated indicated that a considerable potential for expansion remains.

The districts of Briereville, Rich Lake and Normandeau-Goose Lake form an intermediate group between the cash grain region and the pioneer areas. While basically there is very little difference between these areas and the grain districts, the size of farm and the percentage of cultivated land being approximately the same in each case, one noticeable difference is the number of farms with less than 250 acres cultivated. The proportion of farms with more than 160 acres cultivated is also significantly smaller.

Of the fringe areas, Helina stands out as a typical pioneer

district. Around Helina the very much smaller farms have a reasonably large percentage of their total area under cultivation. However, as the cultivated acreage per farm is 185 and only half have 50% of their area under cultivation, it follows that the total amount of improved land is not large, and that there is a wide range in size for both actual and improved acreage. Eighty three per cent of the farms in the Helina district do not have 250 acres under crops.

When the amount of cultivated land on an average farm in the Lac La Biche study area is compared with the cultivated acreage on the average Alberta farm differences become immediately apparent (Fig. 5.3). The average Alberta farm had 393 acres under cultivation in 1966, while the average for the study sample is 285. Returning to the format used in Table 5.4 and eliminating the 14 farms within the sample which possessed over 1,000 acres, a completely different pattern of cultivated acreage is found (Table 5.9)

Table 5.9

Cultivated Farm Size Within the Study Sample.

Number of Farms	Percentage of sample	Total Cultivated Acreage	Percentage of Cultivated Acreage	Average per farm Cultivated
97	100	27,620	100	285
14	14	8,200	30	585
83	86	19,420	70	234

Source: Fieldwork 1968.

The 97 sample farms have a total cultivated area of 27,620 acres giving an average of 285 cultivated acres per farm (Fig. 5.3), 108 acres below the Alberta average. However, the 14 large farms which make up 14% of the Lac La Biche sample own 8,200 acres or 30% of the total cultivated acreage. This gives these farms an average of 585 cultivated acres each, 192 acres more than the Alberta average. The remaining 83 farms (86% of the sample) had a cultivated area of 19,420 acres, 70% of the total acreage. The average is then 234 instead of 285 acres, that is 159 acres or one quarter section below the Alberta cultivated acreage. Compared with the Alberta average several features become apparent.

(1) Total farm size of these farms is only 98 acres more than the average number of cultivated acres in Alberta. However, the variety of farm sizes within this 86% means that many can never hope to attain the Alberta cultivated average even if their whole farm is cultivated.

(2) Their average cultivated acreage is one quarter section below the Alberta average.

(3) A small farm cultivates on average an area only equal to 40% of that cultivated by a large farmer.

(4) The larger farms have on the average an additional 875 acres on which to expand either crop products or, as they are presently doing, their cattle enterprises.

Several other factors are significant when the group of smaller farms is examined:

(a) 41% of these farmers own less than 320 acres (two

quarters) -- which is a reflection of the influence of the homestead period.

(b) 19% do not cultivate more than 140 acres (see table of farm size and cultivated acreage Appendix I).

(c) As regards cultivated acreages the Census group 70-239 acres contain 58% of these smaller farms and only 28% of all the cultivated land.

Potential Arable Land

Considering ways and means of increasing the cultivated acreage on smaller farms, it is felt that one possibility for expansion lies in bringing the potential arable land on each farm into production. Potential arable land which occurs within the Lac La Biche sample is usually uncleared land covered with heavy brush. None of the farmers have any positive proof that this land actually could be arable, but generally base their assumption on the quality of the cleared land around it. The distribution of potential arable land is shown in Table 5.10.

Table 5.10

Distribution of Potential Arable Land by Farm Size Class.

Size Class	70-239	240-399	400-559	560-759	760-1119	1120-1599	1600-2259	2240-2879
No. of Acres	410	2462	2940	5020	3700	4780	2720	1200
No. of Farms	9	22	17	20	12	10	3	1
Average per Farm	46	112	173	251	308	476	907	1200

Source: Fieldwork 1968.

Once again the smaller farms are in a deficient position with little land reserves left to be developed. In the category of 70-239 acres most of the farms possess only one quarter section (160 acres) and on the average have only 46 acres remaining to be cultivated. The two quarter (320 acres) farms, dominant in the second category, are in a slightly better position with 112 acres on the average of potential arable. From this point the average size of potential arable progressively increases with the increasing size class of the farms. Within the sample many of the large farms have more unexploited acreage than the smaller farms own as total land area. Examining the distribution of potentially arable land in Table 5.10 it is evident that the bulk of unused land lies with the top land holding categories. In fact 53% or 12,400 acres of potential arable land belongs to the 26 farms in the top farm census categories -- that is one quarter of the sample farms.

The 14 large farms were isolated in order that the distribution of potential arable available to the smaller farms could be examined (Table 5.11).

Table 5.11

Potential Arable Land Within the Study Sample.

No. of Farms	Percentage of Sample	Total non Cultivated Acreage	Percentage non Cultivated Acreage	Average non Cultivated per Farm
97	100	22,652	100	240
14	14	8,700	38	621
83	86	13,952	62	168

Source: Fieldwork 1968.

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[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

The resultant tabulation shows the familiar pattern in which the large farms control adequate expansion facilities in the form of 38% of the potentially arable land. Each farm has an average of 621 acres unbroken. On the other hand the remaining 83 farms own 62% of the cultivable land (13,952 acres) giving them an average of 168 acres (one quarter approximately) for farm expansion. However, as already pointed out, the very small farms have virtually no land on which to expand; the alternative, then, is for them to purchase more land and then to clear it. The availability and quality of such unoccupied land is discussed in the next section.

Occupation and Utilization

Land utilization can be discussed on two levels. On the general level the degree to which the land is "settled" is significant from the point of view of farm expansion in the area. It is not sufficient, however, just to illustrate the distribution of land in farms. Land in farms is not necessarily land that is actually farmed in the sense that it is used either for crop production or with any degree of intensity for livestock. Therefore on the particular level the main types of farm enterprise indicate the relative importance of the various resources of farm income.

Land Occupation

In the 24 townships included in the study area approximately one third of the area is occupied as shown in Fig. 5.1. This map shows that 30% (924 quarters) is owned by residents living in the area, 5% (176 quarters) by people living outside the area, and

65%(2,000 quarters) is crown land. However, four townships (65 and 66, Rg. 10 and 11) in the northeast part of the region are in Green Zone Forest Reserve and not open for settlement although some land had been settled in two of them before they were withdrawn from settlement.

Although the 1,544 quarters comprising the unoccupied land seem to represent an adequate land bank for future farm expansion closer examination proves this assumption to be erroneous. Less than half (738 quarters) is located in the more densely settled areas giving one and one half quarters of unoccupied land for every four quarters of occupied land. The remaining 806 quarters of crown land consists of non arable third class forest soils in the periphery of settled areas. Essentially this means that most of the available land in the study area, especially in the more intensely settled areas, has been occupied and there is little left for farm expansion except through farm consolidation.

The land owned by non residents is of two types. Primarily it is comprised of farms which have been abandoned, and although the owners still remain in possession they do not live in the area nor engage in farming. For the most part these farms are rented to resident farmers as hay and grazing land. Secondly there are some quarter sections on the margins of lakes which are largely held for speculative purposes, operating both as part time farms and as prospective sites for lake resorts and cabins. The areas of most intensive occupation are in the Venice, Hylo and Craigend districts. In these districts especially in Twps. 66, Rg. 14 and 15, and in Twps. 65, Rg. 13, 14

and 15.72% of all land in the districts is occupied. By contrast Twp. 63, Rg. 10, 11 and 12, and Twp. 64, Rg. 10 and 11 in the Helina and Briereville districts has only 33% of the land in farms.

Beyond the contiguously settled area development is negligible, the only occupation of note being a long exploratory finger of settlement extending northwards from Goose Lake into the forest and on to the poorer grey wooded soils in Twps. 64 and 65, Rg. 11. It is significant that for the most part farming activity stays within the bounds of the "better" grey wooded soils.

Land Utilization

Utilization of improved land indicates the predominant types of farm enterprise and throws some light on the relative importance of the various sources of farm income. Around Lac La Biche the cool season crops of oats and barley figure prominently in farm programs and are grown in association with livestock enterprises. On an acreage basis wheat is the third most important grain and is grown as a cash crop.

Within the sample area, 45% of rotation cropland is used for cereal grain production (54% was the Alberta provincial average in 1966). Four basic crops were grown in 1967. Ranked by decreasing acreage they were hay, oats, barley and wheat (Table 5.12). Insignificant amounts of rape and flax were also grown but with the exception that wheat ranked third in acreage behind oats and barley rather than first there was no evidence indicative of any changing trends in the familiar wheat, oats, barley pattern of Prairie farming.

The distribution of crops in the various districts is shown in Table 5.12.

Table 5.12

Crop Distribution Around Lac La Biche

District		No. of Farms	Farm Area	Cultivated Land	Wheat	Oats	Barley	Hay	Rape	Flax
Venice	Total	9	5,120	2,350	415	795	465	715	--	--
	Per Farm		569	261	46	88	58	89	--	--
Hylo	Total	14	10,020	3,780	565	1,405	910	1,820	--	--
	Per Farm		716	270	40	100	65	130	--	--
Craigend	Total	5	3,920	1,850	340	448	225	830	--	--
	Per Farm		784	370	68	90	56	207	--	--
Lac La Biche	Total	13	7,660	3,260	334	895	555	1,505	--	--
	Per Farm		589	251	37	75	50	125	--	--
Rich Lake	Total	13	6,960	3,235	297	641	324	2,010	--	--
	Per Farm		535	249	33	53	32	154	--	--
Briereville	Total	7	4,980	3,040	200	660	290	1,435	--	14
	Per Farm		710	434	50	132	48	205	--	--
Normandeau/	Total	9	9,460	4,160	440	785	370	2,280	40	20
Goose Lake	Per Farm		1,051	462	55	98	53	285	--	--
Helina	Total	12	4,560	2,220	160	500	190	1,360	25	--
	Per Farm		380	185	18	42	19	113	--	--
Caslan/	Total	15	8,160	3,725	460	745	295	2,307	30	10
Noral	Per Farm		544	248	31	50	26	153	--	--
Grand Total		97	60,840	27,620	3,211	6,874	3,624	14,232	95	44
	Per Farm		627	284	33	71	37	145	--	--

Table 5.12 was converted into a land utilization table in which the various districts were grouped together on the basis of land use so that each group shows similar agricultural emphasis. As in Chapter IV where farm type areas were recognized on the basis of income, three areas of farm enterprise are recognizable through crops grown. Districts which had more than 50% of improved land in grain production were assigned to Zone I, the cash grain area. Zone II is the mixed farming region with more than half the improved land in hay, and a major emphasis on livestock production in association with feed grains. Zone III is the area where active pioneering is still taking place and the farm enterprise is small scale and focussed on livestock.

This taxonomy (Table 5.13) highlights the variation in agricultural emphasis which exists from zone to zone, and classifies crops according to their importance.

Zone I

The districts which constitute Zone I are the first agricultural settlements in the Lac La Biche region. A combination of better soils and easily cleared gently undulating land made it possible to produce grain reasonably successfully, so that the grain growing tradition of the southern prairies, not unexpectedly, carried over into this area as the dominant agricultural enterprise. There is, however, one significant difference. Here wheat was not the major crop but yielded pride of place to oats on an acreage basis.

The main findings for the cash grain region are as follows: 51% of all wheat, 52% of all oats, and 61% of all barley produced

Table 5.13

Land Utilization and Farm Types.

	No. of Farms	Improved Acreage	Wheat	Oats	Barley	Hay	Animal Units
Zone I - Grain Farming							
Venice	9	2,350	415	795	465	715	196
Hylo	14	3,780	565	1,405	910	1,820	876
Craigend	5	1,850	340	448	225	830	403
Lac La Biche	13	3,260	334	895	555	1,430	583
	41		1,654	3,543	2,155	4,795	2,058
Percentage of farms growing crops			90%	98%	90%	90%	90%
Average per farm			45	89	58	130	56
Percentage of improved land			14%	28%	18%	40%	
Zone II - Mixed Farming							
Rich Lake	13	3,235	297	641	324	1,980	1,104
Briereville	7	3,040	200	660	290	1,405	946
Normandeau/ Goose Lake	9	4,160	440	785	370	2,230	1,616
	29		937	2,086	984	5,615	3,666
Percentage of farms growing crops			72%	86%	80%	93%	100%
Average per farm			45	83	43	208	126
Percentage of improved land			12%	23%	10%	55%	
Zone III - Pioneer							
Helina	12	2,220	160	500	190	1,360	555
Caslan/ Noral	15	3,725	460	745	295	2,277	906
	27		620	1,245	485	3,637	1,461
Percentage of farms growing crops			63%	74%	63%	96%	100%
Average per farm			36	62	29	140	54
Percentage of improved land			10%	20%	10%	60%	

Source: Fieldwork 1968.

in the Lac La Biche study area is grown in Zone I. Within this zone, oats was grown on 28% of the total cropland followed by barley on 18% and wheat on 14%. All three crops were produced on every farm visited in the Venice, Hylo and Craigend districts, but wheat declined in importance in the Lac La Biche district where only two thirds of the farms visited produced wheat.

The close relationship between wheat and barley acreages suggested that an attempt was made to grow wheat as the main cash crop, but on an interchangeable basis with barley. Investigation revealed that wheat was generally seeded first on as many acres as possible up to the optimum amount that the farmer required or had seed for. If the weather deteriorated late in the sowing season no more wheat was sown and barley was substituted. Also if untimely frost killed sprouting wheat the land was reseeded with barley or oats, barley being preferred because it returns the next highest price after wheat. In addition the hardier characteristics of barley enable it to withstand early fall frosts which late planting forces the farmer to reckon with. Thus land utilization is to some extent determined by climatic factors, -- the acreage of wheat and feed grain waxing and waning in response to the exigencies of good or bad weather.

Wheat, oats, and barley are all treated as cash crops. In some cases up to 100% of the total crop is sold. For the most part, however, farmers usually sell between 70-80% of their grain, keeping the remainder for seed or for feed for their farm animals. None of the farmers grow oilseeds nor do they express any intention of growing them. Variability of yield is the main objection. Rape, especially,

is considered to be too highly susceptible to frost and not a viable alternative to wheat as a cash crop. They reason that, while poor grade wheat can always be used as livestock feed thereby partially reducing any loss, rape has to be sold at reduced prices.

Hay and legumes are important in maintaining the fertility of the soil and fitting into the rotational pattern in place of summer fallowing which is rarely practiced. Forty per cent of the improved land is under hay which provides the basis for a small livestock operation on each farm. Forage seed cultivation is now only the remnant of a once prosperous industry which has been almost eliminated by competition from the Peace River area.

Zone II

Both physical and economic factors have contributed to the land utilization in this area. The zone lies further from the ameliorating influence of the larger lakes so that wheat and oilseeds are subject to extreme frost hazard. In addition the zone lies almost entirely on the second class soils with intrusions on to third class grey wooded soils. Nevertheless wheat is grown on 11% of the total acreage although the yields are seriously affected by soil conditions. One third of the farms in the Rich Lake district and 43% in the Briereville district do not grow any wheat.

Hay-legume mixture is the most important crop. Occupying 56% of the improved land it provides the basis for a livestock industry. The poor soils of the region demand a rotational pattern which necessitates hay and forage crops every third or fourth year. These crops which condition the soil, thereby eliminating the need

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for summerfallowing, also provide cattle fodder and occasionally cash crops of seed.

The acreage per farm devoted to grain crops is slightly smaller than in Zone I but there is substantially more hay and forage grasses grown on farms in Zone II. The increased number of livestock units per farm is also significant in accounting for the larger hay acreages. Every farm in this zone is oriented towards livestock and mixed farming.

Zone III

In the pioneer areas grain crops have a lesser place in the farming economy. Fewer farms grow grain on fewer acres although the latter probably is due to the smaller size of farm. However, the percentage of improved land per farm devoted to grain is smaller than in the other two zones (Table 5.13). Hay and grass cultivation is emphasised, the farms growing hay on 60% of their improved acreage -- the largest percentage in any zone. Paralleling this is the focus on livestock, every farm in the pioneer areas reporting some livestock enterprise.

Rented and Leased Land

Within the study area 25,619 acres are either rented or leased by the farmers in the sample. Land is leased from the crown and rented usually from non resident farmers. Of this total, one third was rented and the remainder leased. The amount of land held under rental or leasing agreements is shown below (Table 5.14).

Table 5.14

Rented and Leased Land, Lac La Biche Sample.

Area	Total Farms	No. of Farms Renting or Leasing	Land Rented (acres)	Land Leased (acres)	Total Land	Average Per Farm
Zone I	41	18	3,040	3,645	6,685	371
Zone II	29	21	4,530	11,245	15,778	751
Zone III	27	9	960	2,197	3,157	351

Less than half the farmers in Zone I rent or lease land, and those that do hold approximately 371 acres in addition to their own farms. In Zone II almost 75% of farmers occupy land under leasing agreements. These farmers hold more than twice the acreage of those in the cash grain area. Rental and leasing arrangements are not so prevalent in the pioneer zone. Only one third of the farmers in these areas rent or lease land, and on the per farm average this is smaller than the other two regions.

In almost every case, leases held on crown land are cattle grazing leases. This tends to explain the preponderance of leased acreage in the mixed farming area (Zone II) and its relative unimportance in the grain region (Zone I). In each case it is a function of the economy of the area concerned, and the location of that area in relation to crown lands which are available for leasing. The very small amount of rented land in the pioneer zone is evidence of the lack of cleared land and farms available for rent. A map of farms

controlling in excess of 1,000 acres (i.e. land owned, + rented + leased) is shown in Fig. 5.7. Once again it is evident that farms in the mixed farming region control more land than farms in any other zone. Farms controlling over 2,000 acres were quite frequent, especially on the borders of the area. Only a few farms in the grain growing area control over 1,000 acres while two only appear in the pioneer areas.

The Typical Farm

It was found impossible to construct a typical farm for the study area as a whole. However, models of a typical farm for each type of farming situation were constructed omitting any land leased or rented. These models to some extent illustrate the differences within the Lac La Biche region (Table 5).

Table 5.15

Typical Farms within the Lac La Biche Region 1968.

	Farm Type		
	Grain	Mixed	Pioneer
Farm size (acres owned)	652	738	471
Wheat acreage	45	45	36
Oats acreage	89	83	62
Barley acreage	58	43	29
Total grain acres	192	171	127
Hay	130	208	140
Acres of cropland per farm	322	397	267
Number of animal units per farm	56	126	54
A.U's per 100 acres of cropland	17	34	20
Number of farms	41	29	27

FARMS CONTROLLING IN EXCESS OF 1000 ACRES

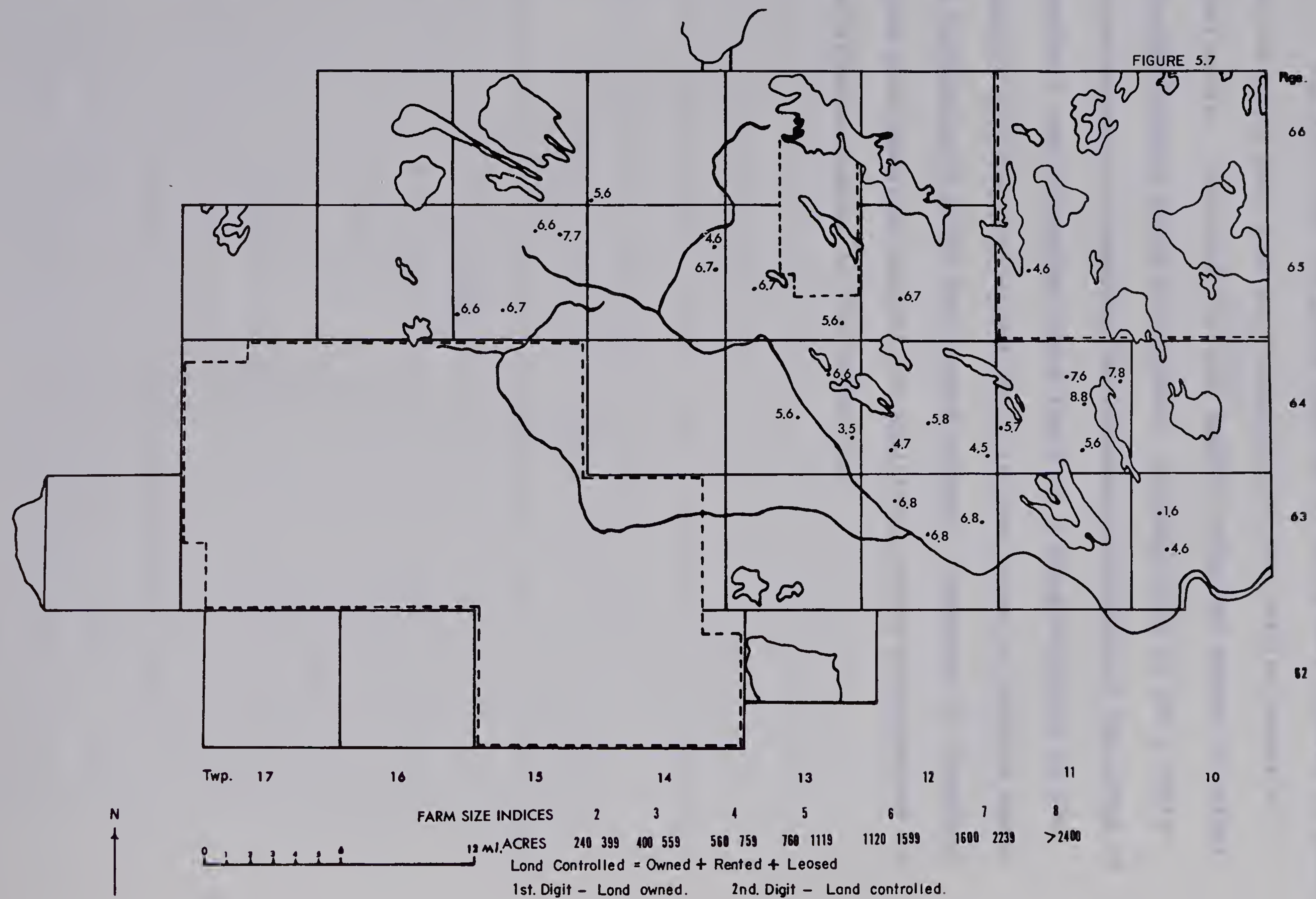


FIGURE 5.7

The fact that the grain farm has 21 acres more planted to grain than the mixed farm does not compensate for the smaller number of animal units. The mixed farm has exactly twice the number of animal units per hundred acres of cropland. Although this is not a satisfactory measure in comparing the livestock enterprise of one group of farms with that of another where there is a large variation in the number of cultivated acres per farm, it does serve to indicate where the difference in gross farm income arises. Investment in livestock is the most important variable in explaining income discrepancies in the different regions in the study area.

CHAPTER VI

ANALYSIS

Measures of Relationship

One objective of the study was to determine the association between the gross farm income derived from marginal farms with a selected number of variables. Gross farm income was selected as the criterion variable because, in general, success or lack of it in farming is usually measured in financial terms. The independent variables are those which it is generally assumed influence farm income and go to make a well structured farm. Such farms as pointed out previously have ample amounts of land, capital and resources of various kinds which permit income parity with urban areas. Conversely marginal farms have reduced amounts of these variables.

The variables chosen for analysis (Table 6.1) are generally instrumental, that is, they are variables which may be manipulated and modified by action on the part of the farmer. However, in order to determine if an undesirable situation can be changed by altering or modifying certain variables, it is necessary to discover (a) whether the variable in question is in fact a cause of the undesirable situation, and (b) whether the variable can be modified by action on the part of the farmer.

Certain factors vary in a similar fashion to the degree of success in farming, but this does not necessarily imply a causal relationship. The association may be accidental, indicative of a common cause. A variable may be associated with degree of success

because it is itself caused by success. In many areas close statistical relationships can be found between degree of mechanization and degree of success in farming. This does not solve the problem of the extent to which machinery contributes to farming success, nor the problem of whether success comes first, thus enabling the farmer to purchase additional machinery, even above the amount which might be economically useful. Moreover, the correlation between mechanization and success does not imply that shortage of machinery is a cause of marginal farming, rather shortage of machinery may be an effect of marginality. In the same way "accidental" correlations can be discovered between insufficient capital and farm failure. Insufficient capital may not be the cause of farm failure, it may be a consequence of it.

In relating two variables to each other, correlation and regression coefficients are commonly used. It is also possible -- and helpful -- to indicate graphically by a scatter diagram, the extent to which two measures are related. The tentative specification of the variables themselves is tantamount to the statement of a specific hypothesis.

The hypothesis may be tested statistically by a variety of techniques like Gosset's t-test, or whatever the occasion demands. Whatever technique is used, the outcome is a probability statement. These probability statements are referred to as statistical significance or confidence levels. A statistically significant difference is one which produces a 't' with a small probability. This means that it is not very likely that the difference in question would occur by chance. The lower the probability value, the more certain is it that the

results represent something other than chance. It is common convention to adopt levels of significance not greater than .05 (Ferguson, 1966, p. 164). This is simply a way of stating what has been discussed, that the results would have been expected by chance not more than five times out of a hundred. For most practical purposes it is sufficient to designate the probability as $p \leqslant .05$, or $p \leqslant .01$, or if the result is highly significant $p \leqslant .001$. In the present analysis data were correlated, regression lines drawn and values of 't' calculated in a single program.

Analytic Technique

In this study only suspected relationships were correlated and rejection set at the .05 level of significance. Results are presented in Table 6.1 for the study region as a whole, and for the previously identified type-areas within it.

The method used in this study to portray the relationship between two variables is to plot the distribution of both measures on the same graph and drawing the line of best fit. Usually this regression line is described in terms of a regression equation:

$$Y = a + bX$$

This gives the best fitting mathematical linear relationship between X and Y values. It is a mathematical expression of a straight line with 'a' defining its intercept and 'b' defining its slope.

The techniques of multiple correlation have practical application when it becomes necessary to combine a number of variables to provide the best possible estimate of a criterion measure. Multiple

correlation deals with the calculation of weights which produce the maximum possible correlation between a criterion variable and the weighted sum of two or more predictor variables. The objective of regression analysis is to predict values of Y for given values of X. The general regression model can be represented by the following:

$$Y = b_o + b_1X_1 + b_2X_2 + \dots . \; b_nX_n$$

In the final part of this analysis stepwise regression, a variation of multiple regression is used in an attempt to identify variables which will provide as good a prediction as possible of the criterion. Theoretically variables should be selected which have a suspected high correlation with the criterion and a low correlation with each other. If two variables have a fairly high correlation with the criterion and a low correlation with each other, both measure different aspects of the criterion and both will contribute substantially to prediction. Conversely if two variables have a high correlation with each other, they are measures of much the same thing, and the inclusion of both, instead of either one or the other, will contribute little to the prediction achieved.

Correlation and Regression Analysis

The correlation coefficients for fifteen variables are shown in Table 6.1. In each case the variables are correlated against gross farm income. Certain variables with a high degree of correlation with the criterion and a varying degree of correlation with each other, are chosen for interpretation. In addition others of interest but

not highly correlated with the criterion are also chosen. A few of the variables are plotted graphically and incorporated into the interpretation of the analysis.

Farm Size

Results of Correlation Analysis

In the study area as a whole, farm size showed a moderate correlation with gross farm income. Therefore farms with small acreages will have correspondingly small incomes. Within the mixed farming area, high incomes and large farm acreages are highly correlated, due probably to the necessity for larger farms to cope with the livestock enterprises. However, while the pioneer area had a moderate correlation between farm size and gross farm income similar to the study area as a whole, the grain growing area yielded only a weak correlation and was within the rejection region. The difference in explanatory power can be attributed to the higher percentage of improved land relative to total acreage on mixed and pioneer farms when compared to grain farms.

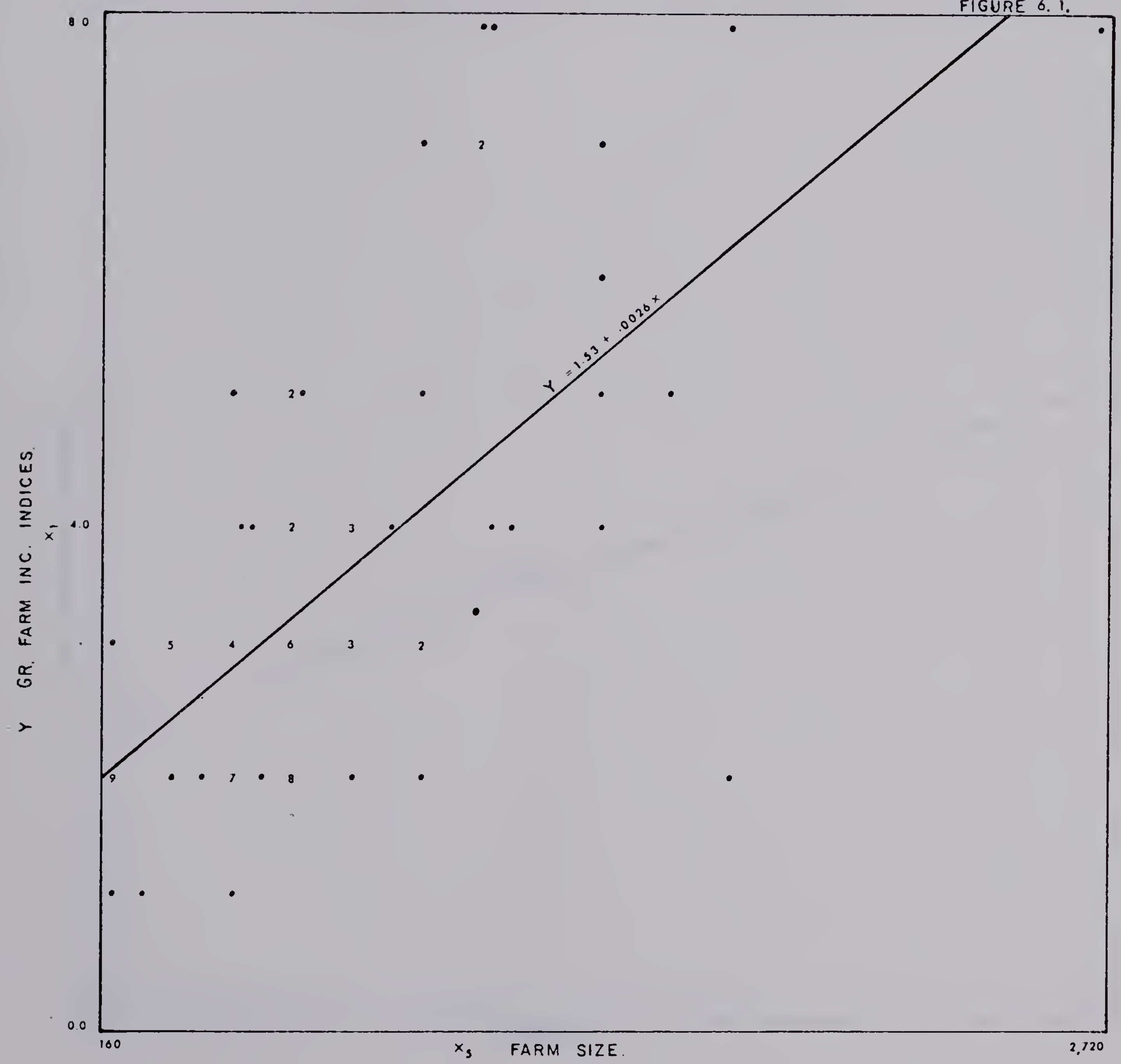
Simple Regression

Regression lines were drawn for selected variables in the study region and for the farming areas within it (Figs. 6.1, 6.2, 6.3, 6.4). Using the three factors which are of prime importance in determining the significance of the trend -- number of points, slope of line, and degree of scatter of the points about the lines, the following conclusions were reached.

REGRESSION LINE OF FARM SIZE AGAINST GROSS FARM INCOME FOR

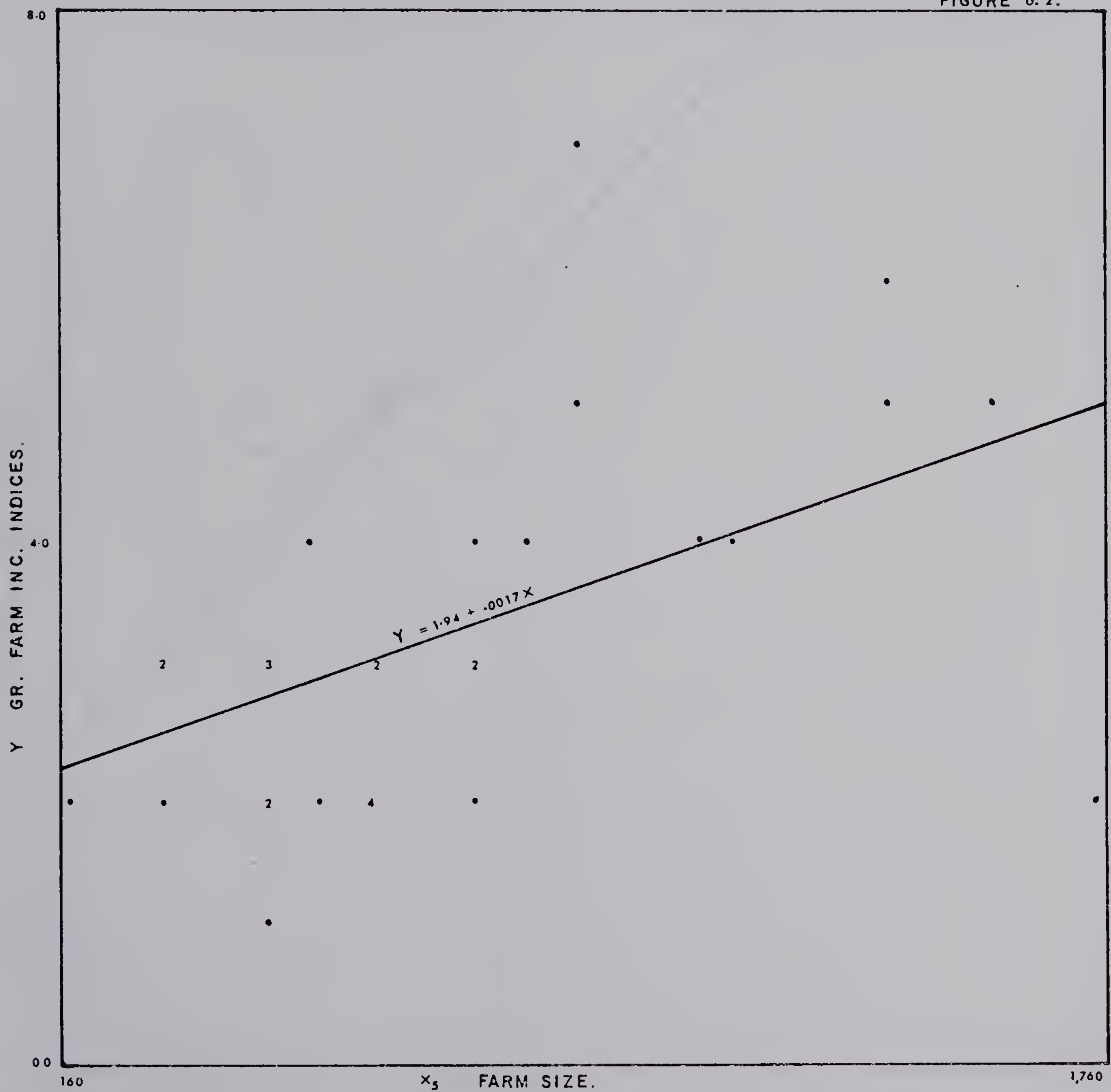
STUDY AREA

FIGURE 6. 1.



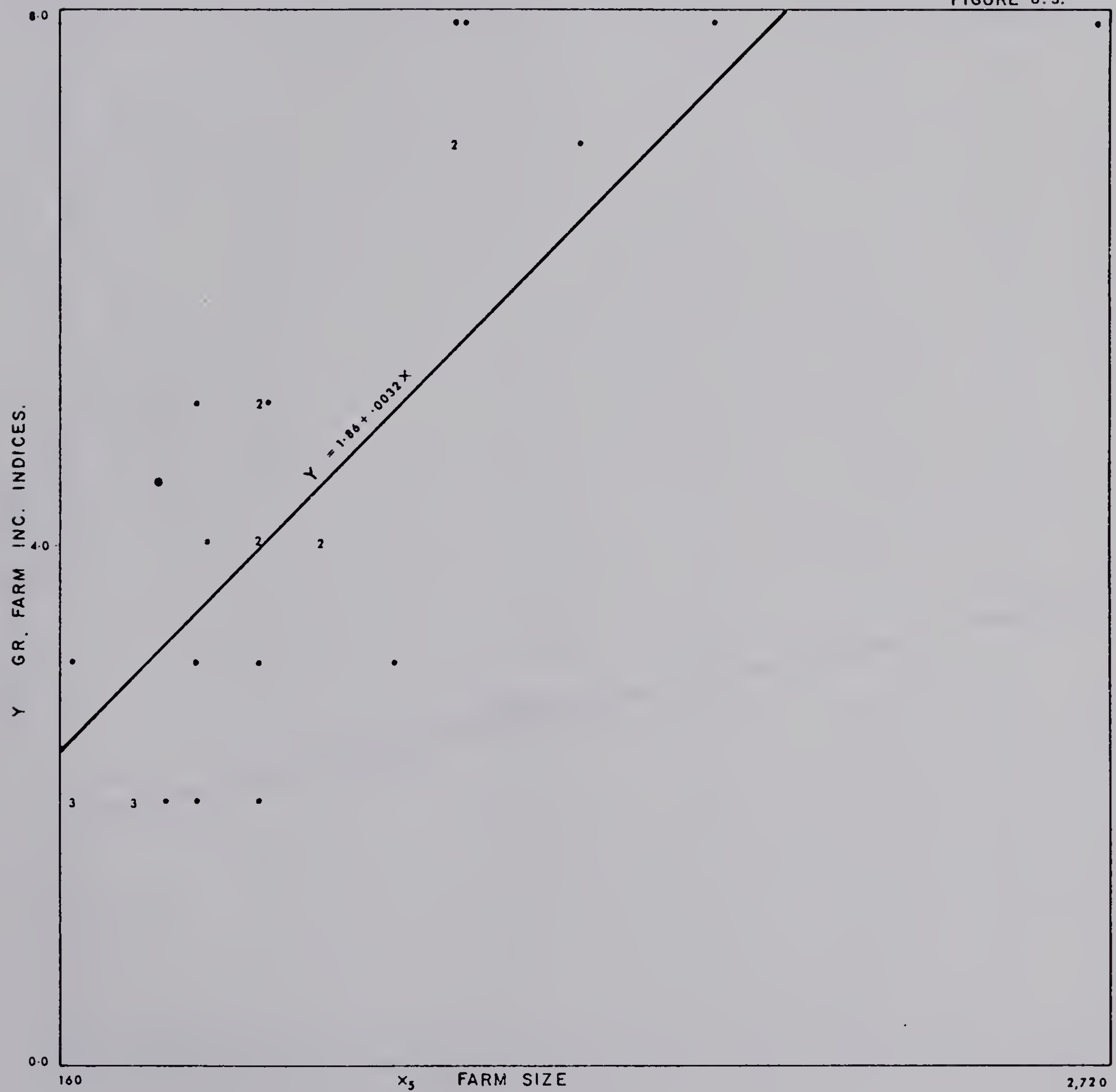
REGRESSION LINE OF FARM SIZE AGAINST GROSS FARM INCOME FOR GRAIN AREA

FIGURE 6.2.



REGRESSION LINE OF FARM SIZE AGAINST GROSS FARM INCOME FOR MIXED FARMING AREA

FIGURE 6.3.



REGRESSION LINE OF FARM SIZE AGAINST GROSS FARM INCOME FOR PIONEER AREA

FIGURE 6.4.

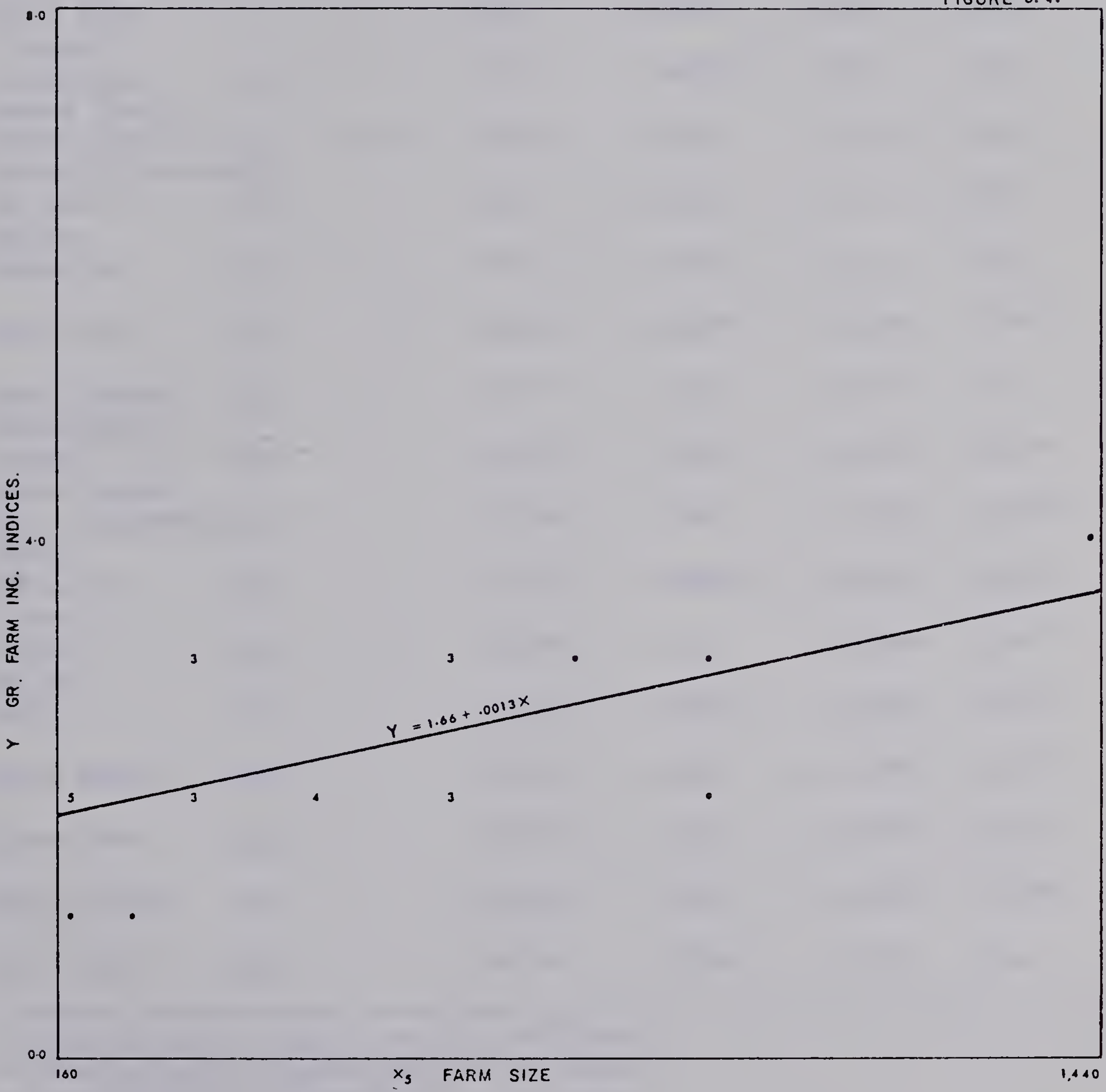


Table 6.1

Correlation of Various Factors with Gross Farm Income. Lac La Biche 1968.

Factors	Variable No.	Gross Income			
		Study Region	Grain Area	Mixed Area	Pioneer Area
Gross farm income	Y	1.000	1.000	1.000	1.000
Percentage income (grain)	X_1	-.225	-.467**	-.047	.402^{+}
Percentage income (livestock)	X_2	.174	.289	.117	-.129
Non farm income	X_3	-.287	-.049	-.213	-.077
Education	X_4	.095	.123	.135	.216
Farm size	X_5	.646*	.416**	.809*	.608*
Acres rented	X_6	.327*	.091	.383^{+}	.025
Cultivated acres	X_7	.768*	.523*	.895*	.663*
Acres arable non cultivated	X_8	.383*	.194	.522**	.488**
Farm valuation	X_9	.740*	.506*	.892*	.415^{+}
Acres leased	X_{10}	.468*	.237	.535**	-.389^{+}
No. of cattle	X_{11}	.700*	.533*	.735*	.685*
Acres wheat	X_{12}	.370*	.260	.544**	.410^{+}
Acres oats	X_{13}	.507*	.250	.686**	.604*
Acres Barley	X_{14}	.436*	.256	.735*	.512**
Acres hay	X_{15}	.602*	.463**	.700*	.334

* Statistically significant at .001 level.
** Statistically significant at .01 level.
\+ Statistically significant at .05 level.

(1) For the study area as a whole (N = 97), farm size correlates with farm income. However this is the average for a multi-type region and the fairly wide scatter of the points indicates disparities. The degree of disparity is not fully revealed until the sub-areas are analysed.

(2) The regression line for the grain growing area (N = 41) has a very low slope indicative of a weak correlation. This suggests that financially these farmers are not efficient relative to size. Two causes may underlie this situation; not enough improved land, and emphasis on small grains in a region which is climatically and physically unsuitable.

(3) The regression line for the mixed farming area (N = 29) shows a high correlation with farm income. The slope and scatter of points indicate farm enterprises which bring size and income more closely together. In other words, more efficient use of land -- through livestock.

(4) In the pioneer areas (N = 27) only a moderate degree of correlation exists between farm size and income. However, the higher percentage of land improved per farm relative to overall size yields this unexpectedly high correlation. However these farms are generally small so that amount of income will also be small irrespective of how highly it is correlated with size.

Cultivated Acres

Results of Correlation Analysis

In the study area as a whole, cultivated acreage has a high correlation with farm income. However, this correlation reflects the influence of the very high correlation between cultivated acres and farm income in the mixed farming area, and the moderately weak correlation in the grain growing area. In the first case, the farmers can cultivate as many acres as their livestock enterprise can consume, while in the second case livestock is a secondary activity and the amount of cultivated acreage and farm income is limited by the amount of grain which can be sold.

Simple Regression

The regression lines (Fig 6.5, 6.6, 6.7, 6.8) for all areas regress positively on gross farm income. However, the scatter of points around the regression lines for the grain and pioneer areas is poor. This fact combined with the gentle slope of the graphs indicates a relatively weak trend.

Generally for the study region, and for each of the type areas within it, the larger the farms are in terms of cropland acres, the larger is the income derived from the farm.

Livestock

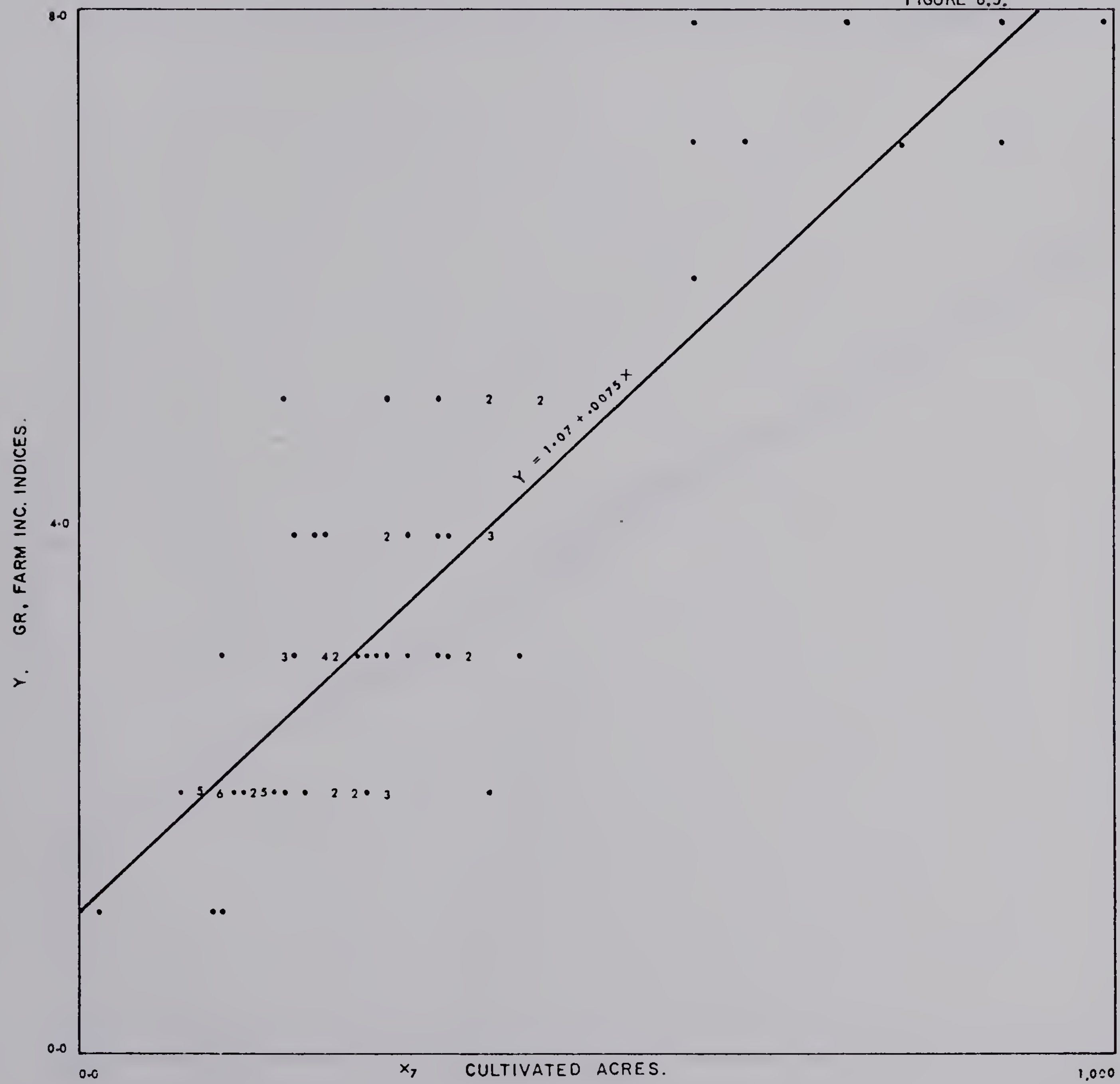
Results of Correlation Analysis

Livestock numbers show a high correlation with farm income for all areas except the grain region. However, even here there is a moderate correlation between numbers of cattle and farm income.

REGRESSION LINE OF CULTIVATED ACRES AGAINST GROSS FARM INCOME FOR

STUDY AREA

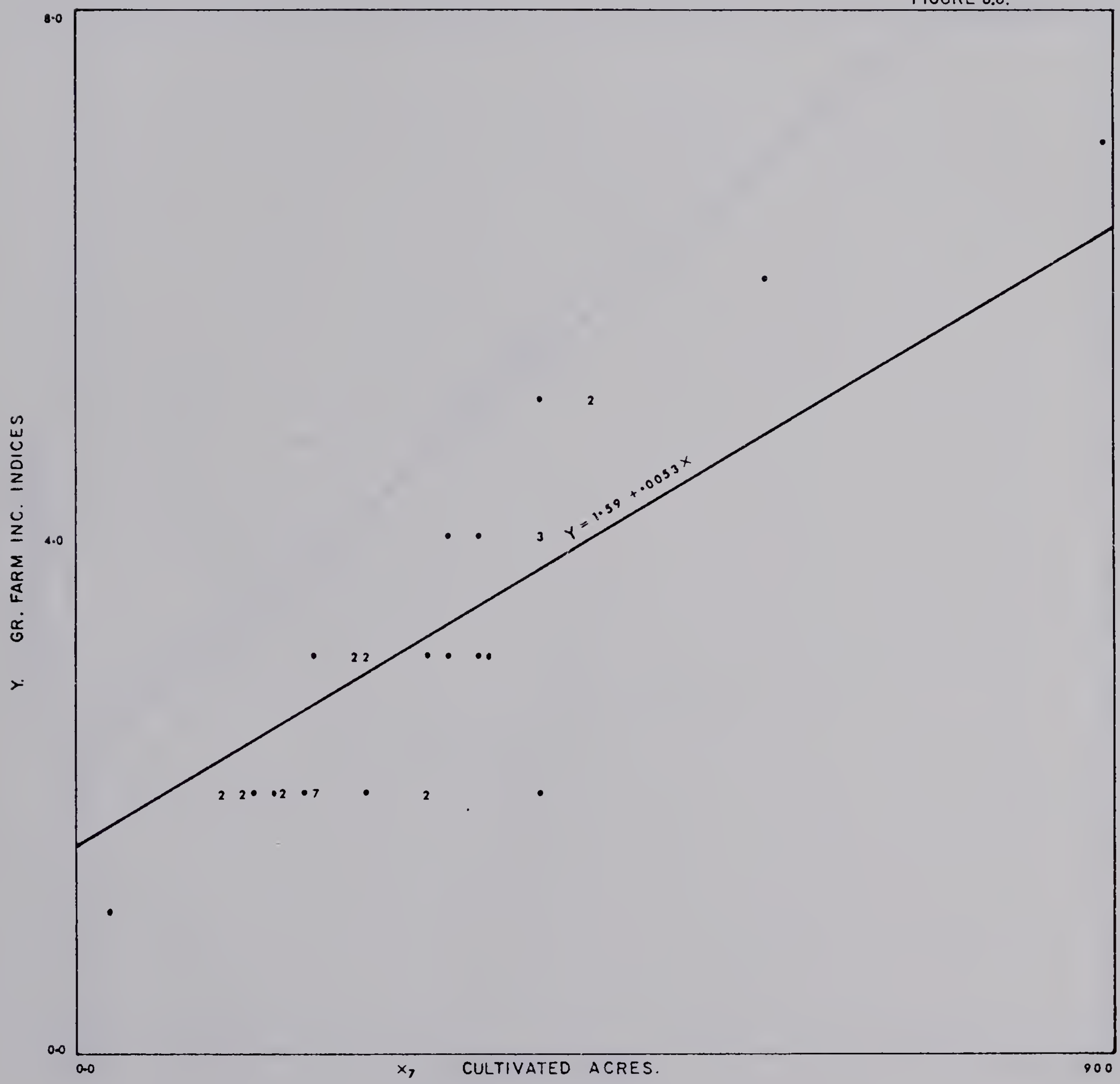
FIGURE 6.5.



REGRESSION LINE OF CULTIVATED ACRES AGAINST GROSS FARM INCOME FOR

GRAIN AREA

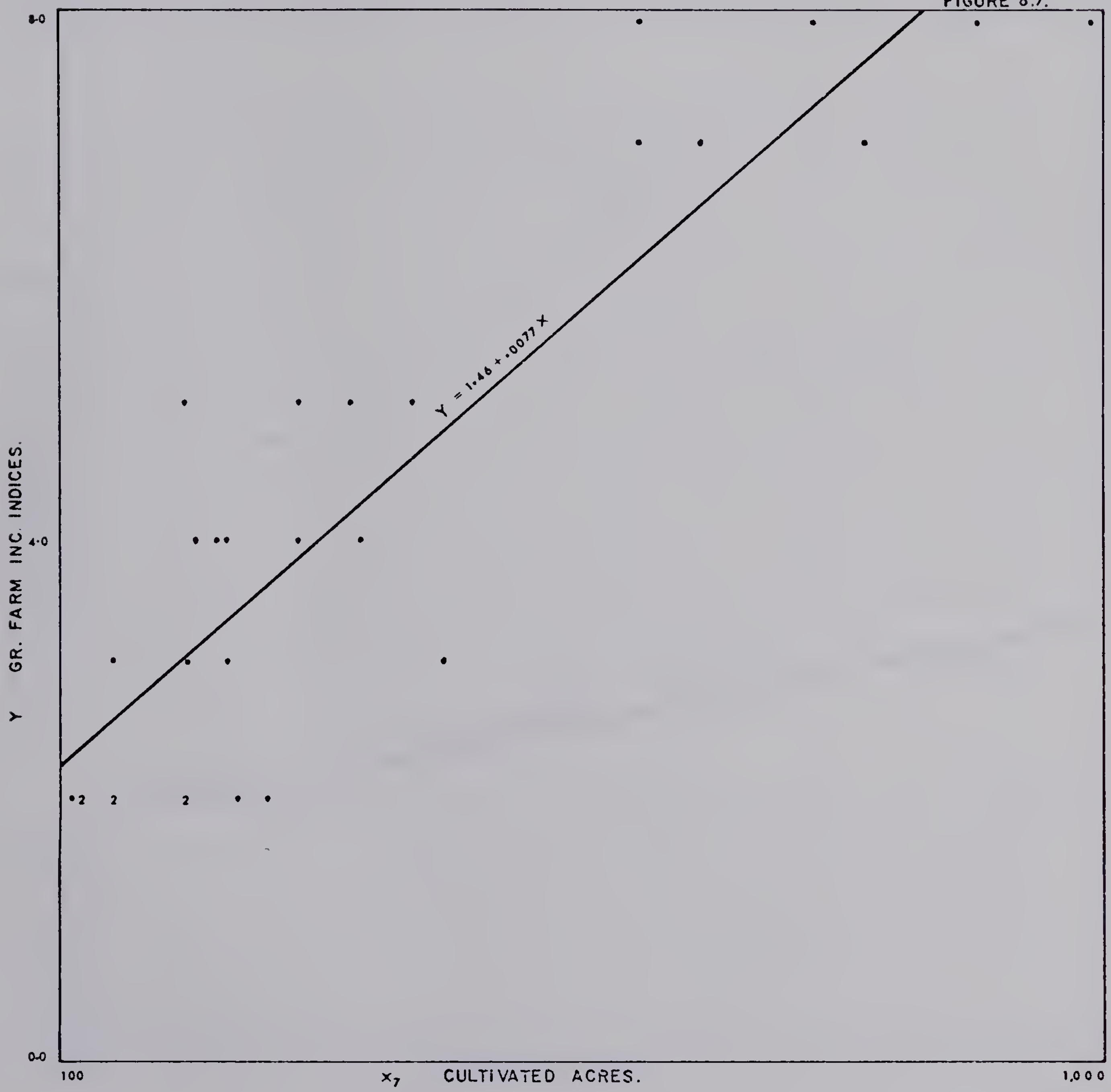
FIGURE 6.6.



REGRESSION LINE OF CULTIVATED ACRES AGAINST GROSS FARM INCOME FOR

MIXED FARMING AREA

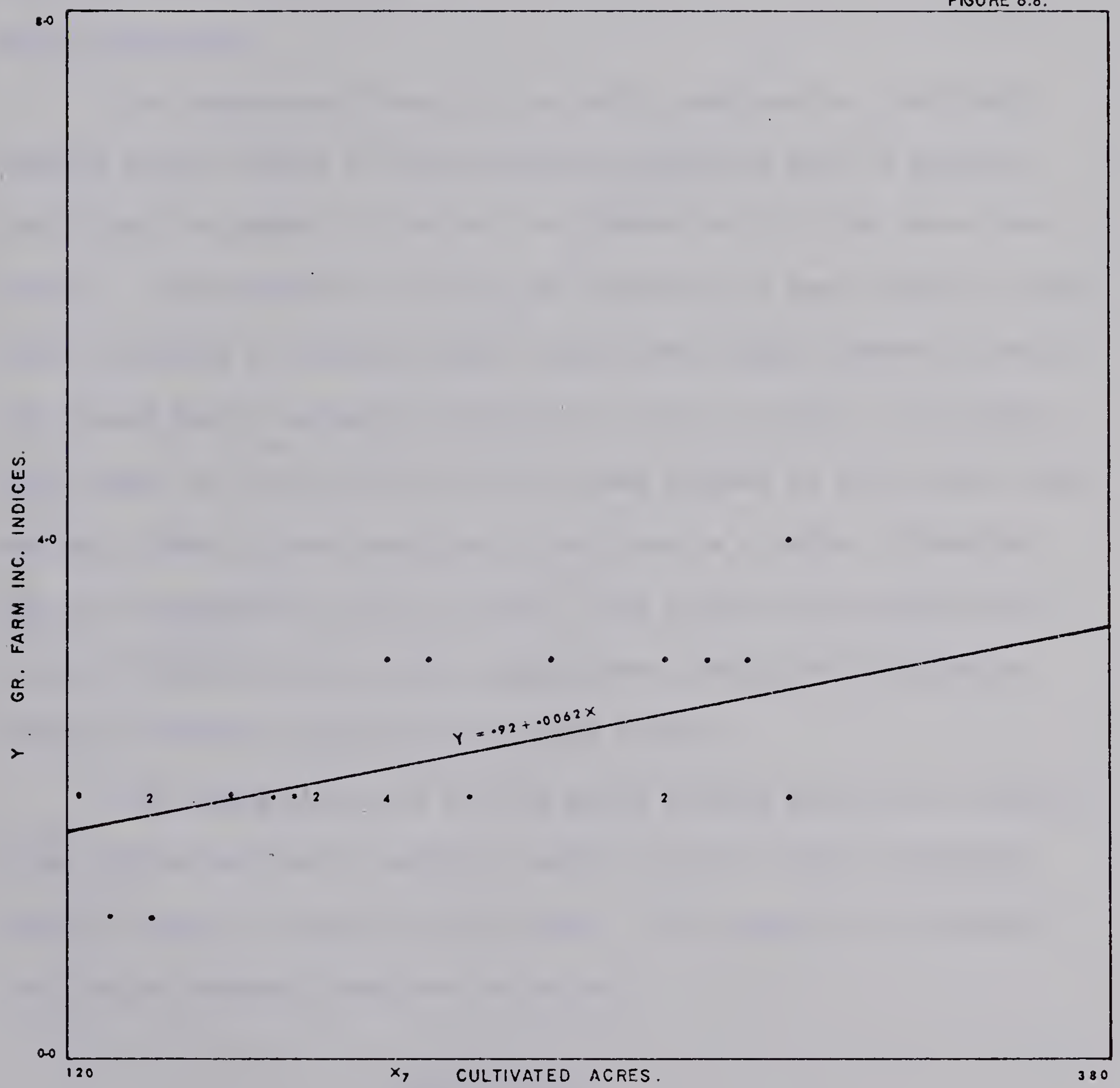
FIGURE 6.7.



REGRESSION LINE OF CULTIVATED ACRES AGAINST GROSS FARM INCOME FOR

PIONEER AREA

FIGURE 6.8.



The indication is that livestock rearing even if it is a secondary enterprise has a decided impact upon gross farm income. For the study region as a whole, the farms which have adopted mixed farming enterprises focussing on cattle are the most successful from the point of view of farm income.

Simple Regression

The regression lines for the study area and for the mixed farming region within it slope steeply indicating that in general the larger the number of cattle, the greater will be the gross farm income. The regression line for the pioneer area has a very low slope which indicates a relatively weak trend even though numbers of cattle and income show a moderate correlation at the .01 level. The underlying cause of this is the fact that farm incomes in the pioneer area are half those in the remainder of the area as a whole. Therefore when the regression lines are scaled, the trend in the pioneer area is weak compared to the other regions even though the correlation may be relatively high within the area itself.

The regression line for the grain growing area has a moderate slope indicating that a moderate amount of farm income is derived from the number of cattle on the farms. This supports the moderate correlation between these two variables.

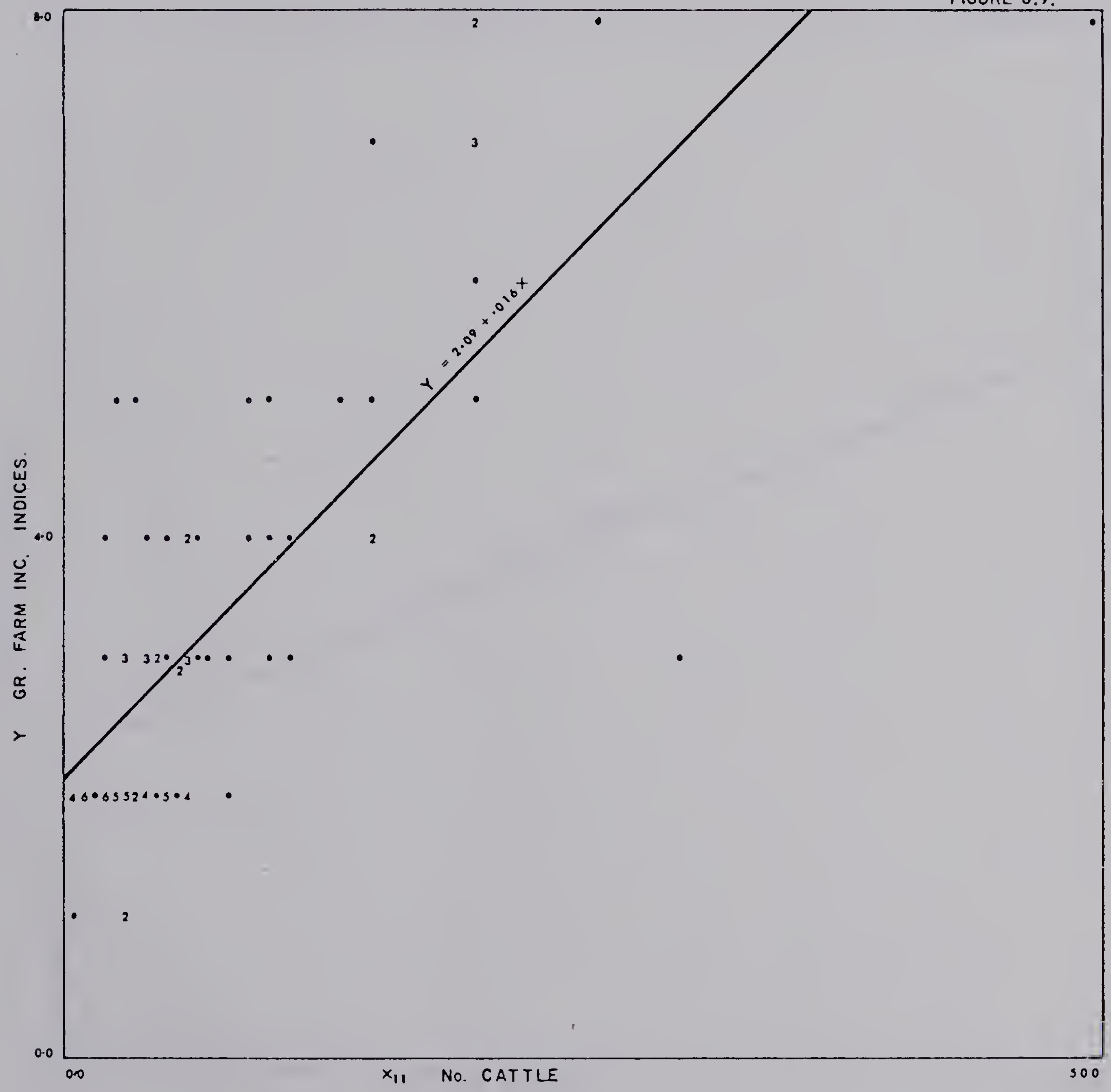
Grain Income

Income from grain has an inverse relationship with farm income for all areas except the pioneer zones. In general as farm income increases in the study area, the proportion of farm income derived

REGRESSION LINE OF NUMBER OF CATTLE AGAINST GROSS FARM INCOME FOR

GRAIN AREA

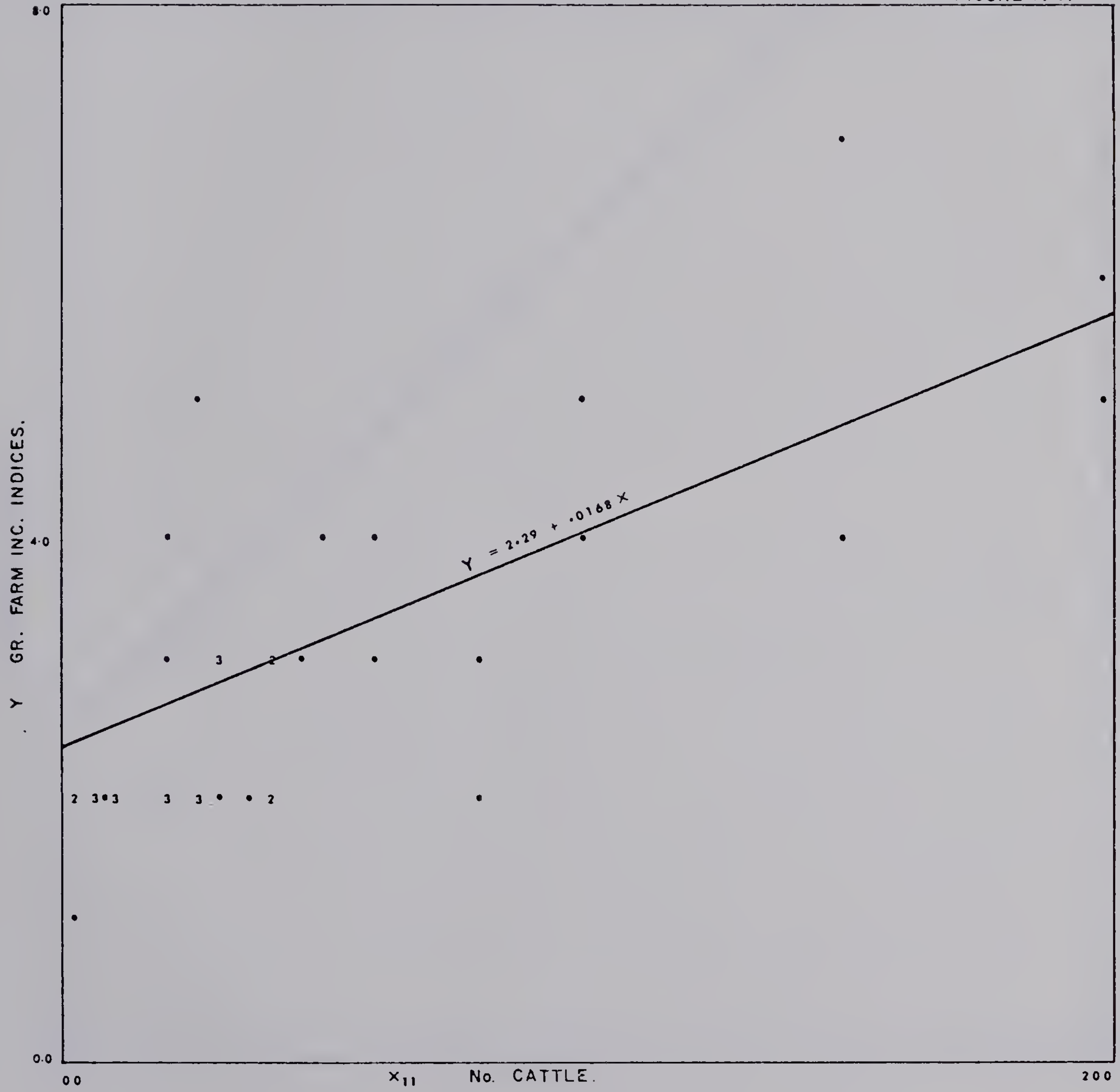
FIGURE 6.9.



REGRESSION LINE OF NUMBER OF CATTLE AGAINST GROSS FARM INCOME FOR

STUDY AREA

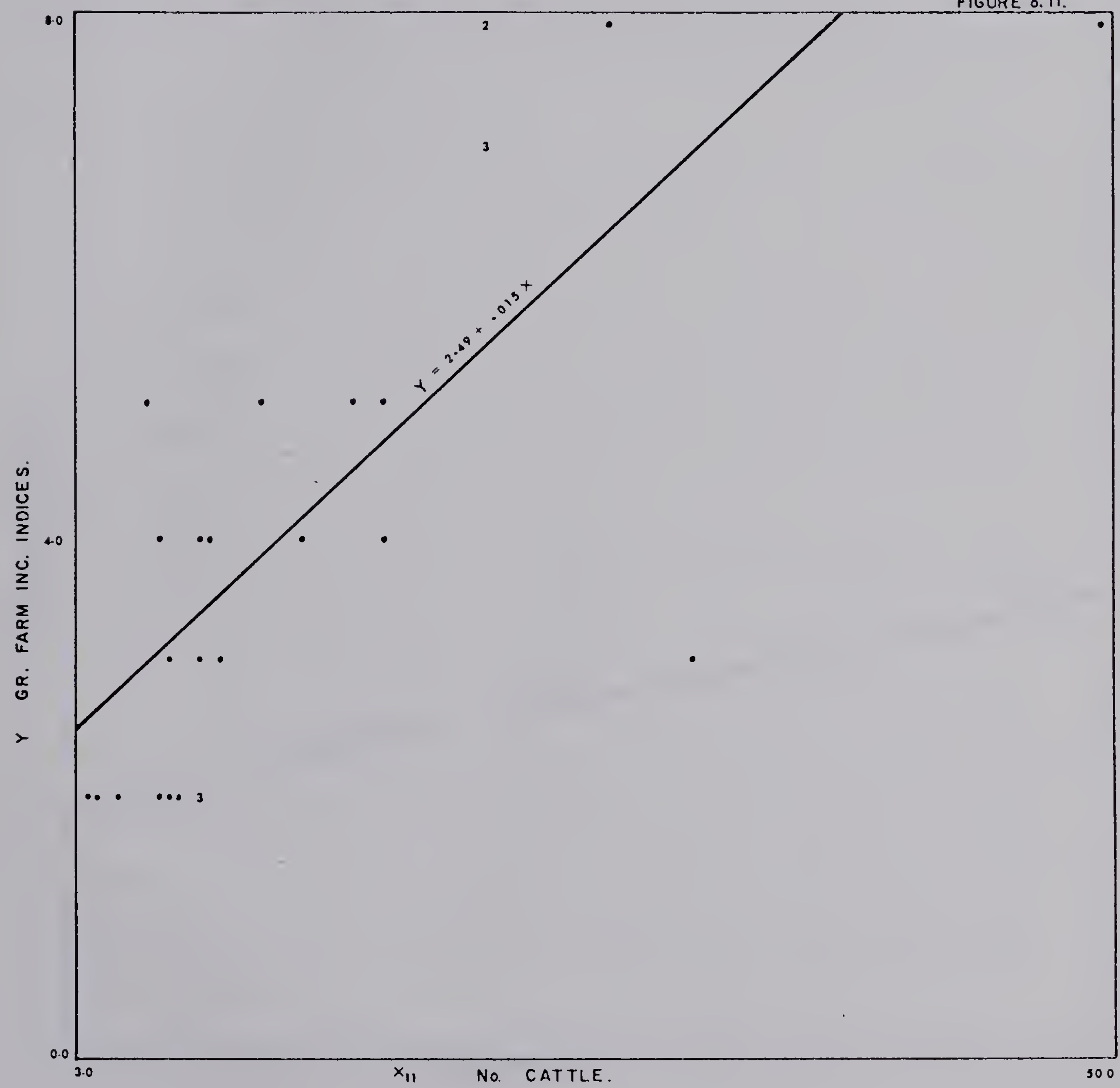
FIGURE 6.10.



REGRESSION LINE OF NUMBER OF CATTLE AGAINST GROSS FARM INCOME FOR

MIXED FARMING AREA

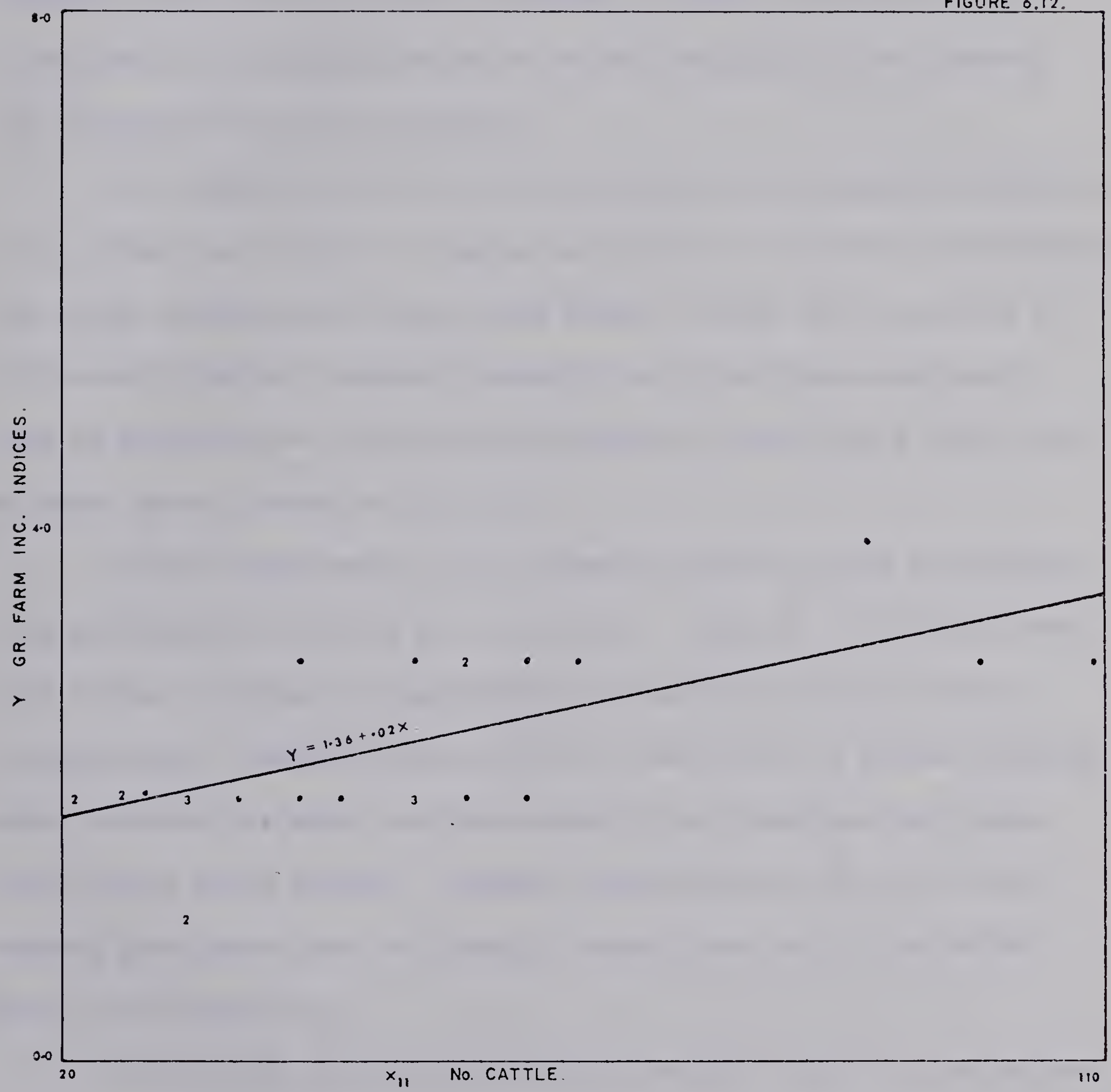
FIGURE 6.11.



REGRESSION LINE OF NUMBER OF CATTLE AGAINST GROSS FARM INCOME FOR

PIONEER AREA

FIGURE 6.12.



from grain becomes less. That is, whenever the farmer homesteads or settles in the area most of his income will be derived from grain sales. However, if he is successful and his gross income increases, the more his income increases, the smaller will be the proportion derived from the sale of grain. Instead a greater proportion will be derived from livestock sales as cattle rearing and mixed farming are substituted for grain growing.

The indication here is that in order to be successful financially, a farmer must strive to change his operation to such an extent that the larger proportion of gross farm income accrues from cattle as in this study although livestock generally will yield the same result. This is indicative of the declining emphasis on grain as a cash crop as farms become economically viable.

On the other hand, in the pioneer regions, income from grain is significant at the five per cent level. That is, on pioneer farms, farm income is directly proportional to the amount of grain sold in most cases. Basically this is due to the nature of pioneer farming, where acreages are small and the necessity for immediate cash tends to dictate a grain economy. However, this trend may not be in error because grain grows well on freshly cleared land due to the native fertility of the soil.

A very weak negative correlation between gross farm income and income derived from livestock tends to support the hypothesis that income on pioneer farms is mainly derived from grain.

The fact that dependency on grain income becomes less as farm income increases suggests that pioneer farms ultimately have

to change their enterprise or else remain marginal

Acres of Grain

Results of Correlation Analysis

Within the study area acres of wheat, and barley do not have a high degree of correlation with gross farm income. Acres of oats, however, have a moderate correlation. However, while this variable has a correlation of .507 with gross farm income, it also has a correlation of .55 with numbers of cattle, both at the .001 level of significance. Therefore it is felt that this is a function of the number of cattle on each particular farm.

In the mixed farming area, the variables representing acres of the various grain crops have a moderate to high degree of correlation with gross farm income. However, once again this is a function of the numbers of cattle on the farm, which in this area have a moderate to high degree of correlation with grain acreage.

Grain acreage in the pioneer area shows a weak to moderate relationship with gross farm income. The moderate correlation of acres of oats and acres of barley with numbers of cattle indicates that they are part of the livestock enterprise. On the other hand, the acres of wheat have very little relationship with numbers of cattle. Therefore, wheat is a cash crop in this area and not a conversion crop.

Within the grain growing area, acres of wheat, oats, and barley have no significant correlation with farm income. In addition they have only a weak correlation with numbers of cattle. Possibly

this indicates the degree of disadvantage experienced by this area and the real source of farm income -- numbers of catttle, which as pointed out earlier have a moderate correlation with farm income. It also emphasises the fact that grain crops are economically unimportant unless grown in conjunction with livestock. Any disparity in farm income from the sale of cash grains must be supplemented by transfer payments from non farm income in lieu of subsidiary livestock on the farm.

Hay

Results of Correlation Analysis

In all areas except the pioneer zone, hay has a moderate to high degree of correlation with gross farm income. However, hay acreage has an even higher correlation with numbers of cattle. Therefore, it can be assumed that acres of hay is another measure of livestock enterprise and a function of the number of cattle.

In the pioneer area hay has no significant correlation with gross farm income. This may be a result of the emphasis on grain production, especially wheat, which on very small farms leaves little land for hay. To some extent this is confirmed by the inverse relationship between acres of wheat and acres of hay, although this correlation is weak and outside the acceptable level of significance.

Stepwise Regression Analysis

The following stepwise regression equations "explain" percentages of variation in gross farm incomes for the study region as a

whole, and for the three types of farming areas which have been identified within it.

The program used in this analysis calculated the percentage each variable added to the prediction of gross farm income. It is therefore easy to observe at what point the addition of further variables added very little to the amount of variance the equation predicted. However, to verify this visual estimate, F ratios were utilized to test the significance of each variable in each equation. To employ this method, H_o, the null hypothesis is postulated for each variable in turn. For example,

> H_o : X_7 (Cultivated acres) does not add significantly to the regression equation.

If this is disproved using F ratios, that is, if the number for F observed (in the calculation) is greater than the number for F critical (calculated from the number of observations and degrees of freedom at the selected level of significance), then H_o is rejected and the alternative hypothesis H_a accepted as follows:

> H_a : X_7 (Cultivated acres) does add significantly to the regression equation.

This process is repeated for each variable in turn until the null hypothesis H_o cannot be disproved. At this point the number for F observed is smaller than the number for F critical and the addition of further variables does not add significantly to the equation and for all practical purposes the equation can be terminated.

<u>The Study Region</u>

The following stepwise regression equation "explains" 63% of the variation in gross farm income in the study region as a whole. The standard errors of the coefficients are given in the brackets below for all equations.

$$\begin{array}{l} Y = 3.025 + .807X_7 - .398X_1 - .348X_2 \\ \qquad\qquad\quad (.0006) \quad (.0066) \quad (.0062) \end{array}$$

The criterion variable Y is gross farm income and the variables X_7, X_1, and X_2 represent cultivated acreage and income from grain and livestock respectively. The importance of cultivated acreage in the overall farm economy is emphasised by its premier position in the equation, and corroborates earlier findings. However, the orientation of the region as a whole to a grain growing economy is underlined by the fact that percentage income from grain X_1 occupies second place in the equation with livestock income X_2 in third place. To some extent the equation presents the degree of maladjustment within the Lac La Biche area.

<u>Grain Growing Area</u>

The stepwise regression equation for the grain growing area "explains" or predicts 60% of the variation in gross farming income.

$$\begin{array}{l} Y = 3.751 + .214X_{11} - .639X_1 - .676X_2 + .67X_7 \\ \qquad\qquad\quad (.0059) \quad (.0088) \quad (.0119) \quad (.0018) \end{array}$$

Although this is mainly a grain growing area, the importance of the number of cattle X_{11} in maximizing gross farm income verifies that farm enterprises which are based on a livestock economy are the most

profitable. Not surprisingly income from grain sales X_1 is of major importance within this sub-area. The importance of cultivated acres X_7 as well as number of cattle in the above equation indicates the profitability of large farms as represented by cultivated acreage and livestock enterprises.

<u>Mixed Farming Area</u>

The variables X_7 acres cultivated, X_9 farm valuation or value of land and buildings, and X_{14} acres of barley predict approximately 86% of the variation in gross farm income in the mixed farming area.

$$\begin{aligned} Y = .907 &+ .471X_7 + .014X_{14} \\ &(.00015)\ (.1839)\ (.0081) \end{aligned}$$

These findings indicate that the larger the number of cultivated acres, the larger will be the gross farm income.

It is reasonable to suggest that number of cattle would be a better predictor of gross farm income in this area. However, cultivated acreage determines the size of the cattle herd on any farm, and therefore is a better predictor of income. Both acres cultivated and number of cattle correlate very highly (.82 at the .001 level of significance).

Similarly farm valuation X_9 is not only a determinant of total farm size and cultivated acres, it is also an indicator of the quality and potential of a farm. On the other hand some farms in this area are extremely large, so that farm valuation may just be an indicator of mere size. This would allow a large number of cattle to be owned, and also provide adequate land for feed grain production.

The presence of acres of barley is rather difficult to explain in the equation. It may be that farms which emphasise barley production as feed grain are able to maintain larger numbers of cattle. If this is so, gross farm income would be greater and acres of barley would be a good predictor. In fact numbers of cattle and acres of barley have a moderate correlation at the .001 level in this area.

Pioneer Area

The following regression equation "explains" 69% of the variation in gross farm income within the pioneer area. The criterion variable Y is still gross farm income.

$$Y = 1.39 + \underset{(.0035)}{.556X_{11}} - \underset{(.0003)}{.381X_{10}} + \underset{(.0005)}{.337X_{8}}$$

Once again as in the grain growing area the importance of livestock within the farm operation is emphasised. In fact the first two variables, X_{11} number of cattle, and X_{10} acres leased all point to the economic advantage of a cattle rearing economy. To a certain extent this is reinforced by the variable X_8 non cultivated acreage, which is used for pasture purposes.

In summary the analysis established that (1) Farms which have the higher percentage of improved acres and are based on a livestock enterprise have the highest gross farm income. (2) There are areas within the Lac La Biche region which are oriented to the prairie tradition of cash grain growing and from which farmers receive the larger proportion of their farm income. Yet within this area, farms featuring livestock even as secondary enterprises gross the most farm income.

CONCLUSION

The structure of the investigations for this study has without doubt biassed the result. The underlying assumption that anything less than 160 acres is not a viable farm unit effectively eliminated many so called farmers who are often counted in the marginal category.

One of the major questions requiring answering was, "is the Lac La Biche region really marginal if this bottom segment is eliminated"? In fact a bottom limit is probably well above 160 acres in this northern area of Alberta. The area is generally marginal for farming, most of the problems arising from farms which control less than 640 acres.

Investigations revealed that at a financial level farming operations ranged from subsistence to large commercial enterprises. Farm programs at all levels usually combined cash grain crops with feed grain and livestock. While this type of economy should ensure economic stability, the number of small farms, the widespread distribution of poor soils, and marginal climatic conditions combine to make farming a hazardous enterprise.

Using the criterion of $3,750 as the point of marginality, and using average incomes, the study region is not a marginal area. However, closer examination of income statistics reveal that over half the farms in the sample have gross incomes lower than $3,750, the average being inflated by the much greater incomes of the larger farms.

Distribution of income around Lac La Biche indicated three

distinct income areas. These areas could be associated with the predominant farm enterprise which took place there. A cash grain area from Hylo through Venice and Lac La Biche districts to Craigend had $4,000 - 5,999 as the most common gross farm income category. A standard deviation of 1.6 gives a range of gross farm incomes in this area from $2,200 to approximately $10,000. To obtain a net income range, net income was assumed to be 40% of gross income. This yielded net income figures of $880 - $4,000 per annum. Without doubt this area is highly marginal.

A mixed farming area can be identified southeast of Lac La Biche. The emphasis is on livestock, specifically cattle, and the ready availability of cattle leases on nearby crown lands encourages livestock operations. The average gross farm income category is between $6,000 - $7,900. Within one standard deviation the range is between $4,000 and $12,000. In this region off farm income is negligable.

A surprising finding is that better incomes are not achieved on the first class grey wooded soils. These soils were the first settled and since then the farms have been traditionally oriented to grain farming. However, on the more recently settled second class grey wooded soils, fertilizer programs and crop rotations featuring livestock are essential. As a result better incomes are achieved in this region.

The pioneer areas are located on potentially non arable soils. Farming on the pioneer farms in these places is generally marginal. However, some large ranchers are able to achieve good incomes by an

extensive use of land for cattle rearing. Small farms do not have the land capacity or capital to operate on these standards and feature a cash grain economy with some livestock. Over three quarters of the farmers in the Helina district gross less than $4,000 from farming. To a great extent pioneering or homesteading is a symptom of marginal farming.

In the grain area over half the gross farm income is from the sale of grain and over 70% of the farmers have off farm jobs to supplement farm income. When compared with the mixed farming area with over 80% income from cattle and relatively little off farm employment occurs, the only conclusion which can be reached is that farm income depends largely upon the type of farming carried on. In addition, cash grain farming is highly uneconomic in this area when compared to mixed farming. While marginal farms can be found in both areas, cash grain farming is more productive of marginality than is mixed farming.

Although outside the terms of reference of this thesis, it is felt that non farm employment is a function of nearby urban places with their attendant job opportunities. It is significant that areas in the sample which are relatively isolated from urban towns and villages achieve better incomes, while areas in close proximity to towns and villages have poor farm incomes supplemented by non farm employment. These latter farms are found to be using their land inefficiently in terms of income indices, with the result that it appears that the availability of off farm employment has a deleterious effect on farm income.

Fertilizer use is found to be a good index of marginal farming. Invariably most farms in the sample which are marginal do not use fertilizer. Of course it could be pointed out that they could not afford fertilizer because of the extreme shortage of cash. On the other hand if the farm was of reasonable size the farmer could not afford not to use fertilizer.

The main criteria of success in farming in northeastern Alberta are farm size, cultivated acreage and livestock enterprise as represented by numbers of cattle. In general the larger the farm the larger will be the amount of cultivated land and as a result the gross farm income. In the mixed farming area the number of cattle that farms can support is determined by the size of farm and cultivated acreage.

The statistical analysis confirms that farm size, cultivated acres and number of cattle are among the variables which correlate most highly with gross farm income. By using stepwise regression, regression equations were derived which aid prediction of gross farm income for certain specific types of areas. In effect these equations are models for type of farming areas in the northern agricultural fringe. The equations incorporate different variables which help predict gross farm income for (a) a general area in the northern agricultural fringe (b) an area with a focus on cash grain (c) a mixed farming region (d) a pioneer or homestead area. These equations have not been cross validated and as a result hold good only for the Lac La Biche region. However, unless the intention is to generalize from a sample to a population, and unless the procedures

used are such as to enable such generalizations justifiably to be made, and unless some estimate of error can be obtained, the conduct of experiments is without point. Therefore it is hypothesised that the equations derived from this study hold for the northern fringe of agriculture across the Prairie Provinces because conditions are essentially the same. Agriculture in the northern regions of the prairies is not a solid belt of uneconomic marginal farms. It is a belt in which marginal areas exist side by side with areas of viable agriculture. On the periphery of both lies the settlement and homestead fringe which appears to be hopelessly marginal. The difference between such areas is the type of farm economy pursued, and although all farms with cattle may not be economic, they have a greater chance of becoming economic than any other type.

Finally the use of the A.R.D.A. definition for marginal farming undoubtedly understates the degree of poverty in farming. Around Lac La Biche only 14% of farms could be classed as economic by reasonable Canadian urban standards.

BIBLIOGRAPHY

Alberta, Dept. of Agriculture. Industry and Resources of Alberta Census Division 12, Resource Study 801-2, Edmonton, 1967.

Alberta, Dept. of Agriculture. Acreage Yields and Production of Wheat, Oats and Barley by Census Division 1921-1956, December, 1959.

Bennett, M.K. "The Isoline of 90 Frost-Free Days in Canada". Economic Geog., 35, 1959, 41-50.

Biays, Pierre "Problems de l'agriculture marginale dans la zone pionnière de l'Est de Canada". Cahiers de Géographie de Quebec, 8 année, No. 16, April-Sept., 1964, p.219-229.

Bogue, Don. J. The Structure of the Metropolitan Community; A Study of Dominance and Subdominance, Unpub. Ph.D. thesis, Univ. of Michigan, 1950.

Booth, E.J.R. Economic Development in Eastern Oklahoma until 1950, Unpub. Ph.D. thesis, Library, Vanderbilt Univ., Nashville, Tennessee.

Bowser, W.E. "The Climate of Alberta". Agricultural Resources of Alberta, 1941-42.

Bowman, I. The Pioneer Fringe, American Geographical Society Special Publication No. 13, The Commonwealth Press, Worcester, Mass., 1931.

Bowman, I. "The Pioneering Process". Science, 75, May 1932, pp. 521-528.

Campbell, N.M. A Case Study in Economic Development: The Bonnyville and Red Deer Farming Communities, Dept. of Agric. Economics, Univ. of Alberta, Spec. Report 3, August, 1966.

Canada, Dept. of Forestry. Federal-Provincial Rural Development 1965-70, Queens Printer, Ottawa, 1966.

Canadian Association for Adult Education. Rural Poverty: What can A.R.D.A. do?, Pamphlet No. 1, 1964.

Carder, A.C. "Northwestern Canada's Climate: Its effect on Crop Growth and Development". Agricultural Inst. Review, 20(3), May-June 1965, pp. 20-24.

Carder, A.C. "Growth and Development of some field crops as influenced by climatic phenomena at two diverse latitudes". Canadian Journal of Plant Science, 37, 1957, pp. 392-406.

Caudill, H. "Reflections on Poverty in America", in A.B. Shostak and Wm. Gomberg, eds, New Perspectives on Poverty, Englewood Cliffs, N.J., Prentice-Hall, Inc., pp. 3-9.

Chapman, L.J., and D.M. Brown The Climates of Canada for Agriculture, Report No. 3, The Canada Land Inventory, Dept. of Forestry and Rural Development, Queens Printer, Ottawa, 1966.

Cohen, R.L. The Economics of Agriculture, Cambridge University Press, London, 1940.

Coligado, M.C., W. Baier, and W.K. Sly Risk Analysis of Weekly Climatic Data, Melfort, Saskatchewan, Tech. Bull. 38, July 1968, Agrometerology Section, Plant Research Inst. (Research Branch) Canada Dept. of Agriculture.

Currie, B.W. Prairie Provinces and Northwest Territories, Snowfall, Physics Dept., Univ. of Saskatchewan, Jan. 1959.

Currie, B.W. Prairie Provinces and Northwest Territories Wind and Storms, Physics Dept., Univ. of Saskatchewan, Jan. 1959.

Currie, B.W. Prairie Provinces and Northwest Territories Precipitation, Physics Dept., Univ. of Saskatchewan, Jan. 1959.

Currie, B.W. Prairie Provinces and Northwest Territories Vegetative and Frost-Free Seasons, Physics Dept., Univ. of Saskatchewan Jan. 1959.

Diehl, W.D. "Farm-Nonfarm Migration in the Southwest: A Cost-Returns Analysis". Journal of Farm Economics, Vol. 48, No. 1, pp. 1-11.

Erlich, W.A., and W.M. Odynsky "Soils developed under forest in the Great Plains Region". Agricultural Institute Review, 15, 1960, pp. 29-32.

Evans, M.W. "Relation of Latitude to certain phases of the growth of timothy". American Journal of Botony, 26, 1939, pp. 212-218.

Ferguson, G.A. Statistical Analysis in Psychology and Education, McGraw-Hill Book Company, New York, 1966.

Galbraith, J.K. Inequality in Agriculture -- Problems and Program, Unpub. lecture, Ontario College, Guelph, 1956.

Gravenor, C.P., and L.A. Bayrock "Glacial Deposits of Alberta". in Soils in Canada, R.F. Legget (ed), Toronto, (The Royal Soc. of Canada, Spec. Pub. 3), 1961.

Gregory, S. "Accumulated temperature maps of the British Isles". Institute of British Geographers, Transactions and Papers, 20, 1954, pp. 59-73.

Hathoway, Dale E. Government and Agriculture, The MacMillan Company, New York, 1963.

Hozack, W.J. Marginal Farming in the Lac La Biche Area, Unpub. Field Camp paper, Dept. of Geography, Univ. of Alberta, Sept. 1967.

Janssen, V., Svenson, K., and R. Meeks Population Characteristics Alberta Census Division 12, Alberta, Dept. of Agriculture, Study 830, 1966.

Janssen, V., Svenson, K., and R. Meeks Agriculture, Census Division Number 12, Alberta, Dept. of Agriculture, Study 801-1, 1965.

Janssen, V.T., et al. Social and Economic Study: Tangent Area Alberta, Alberta, Dept. of Agriculture, Edmonton, 1967.

Kellogg, C.E. Soil, Reprint from Scientific American, July 1950.

Klages. K.H.W. "Temperature Efficiencies and Bioclimatics in Relation to Crop Distribution". Ecological Crop Geography, Chapter XVII, MacMillan Company, New York, 1949.

Kristjanson, B.H. and C.C. Spence Land Settlement in Northeastern Alberta 1943, Publication 800, Tech. Bull. 63, Dominion of Canada -- Dept. of Agriculture, Sept. 1947.

Krumbein, W.C. "The 'sorting out' of geological variables illustrated by regression analysis of the factors controlling beach firmness". Journal of Sedimentary Petrology, 29, 1959-A, 575-587.

Legal, Most Rev. Emile J. (Ed). Short Sketch of the History of the Catholic Church and Missions in central Alberta, Compiled, Winnipeg, Manitoba, West Canada Publishing Co. Ltd., 1914.

Lewis, W.A. "Thoughts on Land Settlement", in Eicher, C., and L. Witt (Eds), Agriculture in Economic Development, Toronto, McGraw-Hill Book Co., 1964.

Lewis, W.A. The Theory of Economic Growth, George Allen and Unwin, Ltd., Ruskin House, London, 1957.

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[illegible]

[illegible]

[illegible]

[illegible]

Longley, R.W. Climatic Maps for Alberta, The Alberta Climatological Committee, Dept. of Geography, Univ. of Alberta, July 1968.

Longley, R.W., and M. Louis-Byne Frost Hollows in west central Alberta, Dept. of Transport., Meteorological Branch, Circular 4532, Tec. 639, 1967.

Longley, R.W. The Frost-Free Period in Alberta, Dept. of Geography, Univ. of Alberta, Edmonton, 1965, mimeo.

Lovering, J.H. "Agricultural Land Use in the Fort Vermilion-La Crite Area of Alberta". Geographical Bulletin, No. 20, Nov. 1963, pp. 39-57.

Mackintosh, W.A. Prairie Settlement, The Geographical Setting, Toronto, The MacMillan Company of Canada Ltd., at St. Martin's House, 1934.

Mackintosh, W.A. Economic Problems of the Prairie Provinces, Toronto, The Mac Millan Company of Canada Ltd., at St. Martin's House, 1936.

Manning, T.W. The Canadian Farm Income Problem, Dept. of Extension, Univ. of Alberta, Edmonton, 1963, mimeo.

Maxwell, J.W. "Agricultural Land Utilization in the Dixonville--Fort Vermilion Area of Alberta". Geographical Bulletin, No. 21, May 1964, pp. 93-122.

Menzies, M.W. Poverty in Canada: Its Nature, Significance and Implications for Public Policy, Manitoba Wheat Pool Elevators, Winnipeg, 1965.

Moroney, M.J. Facts from Figures, Penguin Books Ltd., London, 1951

Murchie, R.W. Agricultural Progress on The Prairie Frontier, Toronto, The MacMillan Company of Canada Ltd., at St. Martin's House, 1936.

McCann, L. Agricultural Land Use in the Lac La Biche Area of Alberta, Unpub. field camp paper, Dept. of Geography, Univ. of Alberta, Sept. 1967.

McCarty, H.H., and J.B. Lindberg A Preface to Economic Geography, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1966.

Nicholls, W.H. "Human Resources and Industrial Development in the Upper East Tennessee Valley 1900-1950". Quarterly Journal of Economics, Vol. 71, No. 2, 1947-48, pp. 289-316.

Nicholls, W.H. "Industrialization, Factor Markets and Agricultural Development". Jour. of Political Economy, 69 (Aug. 1961), 219-340.

North, D.C. "Agriculture in Regional Economic Growth". Agriculture in Economic Development, Eicher,C., and L. Witt, Eds. McGraw-Hill Book Company, New York, 1964, pp. 69-78.

Odynsky, W. et al. Public Lands Open for Settlement in the Fringe Area of Central Alberta, Alberta, Dept. of Lands and Forests and Research Council of Alberta, Edmonton, 1960.

Oppenheimer, H.L. Cowboy Economics, Interstate Printers and Publishers, Danville, Ill., 1966.

Paul, A. "The Development of Investigation into Hail Occurrence in Alberta". Albertan Geographer, No. 3, 1967, pp. 4-10.

Pepin, P.Y. Life and Poverty in the Maritimes, A.R.D.A. Project #15002, Canada, Ministry of Forestry and Rural Development, 1968.

Petersen, T.A. The Agricultural Problem -- Economic Causes and Consequences, Unpub. Paper, Dept. Agric. Economics, Univ. of Alberta, 1968.

Reed, W.G. "The Probable Growing Season". Monthly Weather Review, 44, p.509, Dept. of Agric., Washington, 1916.

Robinson, J.L. "The Northern Extension of the Pioneer Fringe of Agriculture on the Great Plains of Canada". Papers of the International Geographical Union Eighth General Assembly and Seventeenth International Congress, Washington, 1952, 657-662.

Roe, F.G. "Early Agriculture in W. Canada in Relation to Climatic Stability". Agricultural History, 26(3), July 1952, pp. 104-124.

Ross, C.B.A. A Case Study of the Success of Settlement in a Southern Peace River District, Unpub. M.Sc. thesis, Dept. Agricultural Economics, Univ. of Alberta, 1967.

Rostow, W.W. The Stages of Economic Growth, Cambridge, University Press, 1959.

Schultz, T.W. The Economic Organization of Agriculture, New York, McGraw-Hill Book Co., 1953.

Schultz, T.W. Transforming Traditional Agriculture, Yale University Press, London, 1964.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Schultz, T.W. "Reflections on Poverty within Agriculture". The Journal of Political Economy, Vol. LVIII, No. 1, Feb. 1950, pp. 1-15.

Schultz, W.M. The People and Resources of Northeastern Alberta, Dept. of Agricultural Economics, Univ. of Alberta, 1966.

Southern, John H. and B.T. Irma "Opportunities for Economic Development in Low-Production Farm Areas", Agriculture Information Bulletin No. 234, Washington, U.S.D.A., Nov. 1960.

Spence, E.S. Some Aspects of the Regional Economy and the Trade Area of Lac La Biche Alberta, Unpub. field camp paper, Dept. of Geography, Univ. of Alberta, Sept. 1967.

Symons, L. Agricultural Geography, G. Bell and Sons Ltd., London, 1967.

Szabo, N.L. "Area-differential productivity of agricultural resources and off-farm irrigation on the Canadian Prairies". Geographical Bulletin, 8, No. 2, 1966.

Szabo, N.L. "Depopulation of farms in relation to the economic conditions of agriculture on the Canadian Prairies". Geographical Bulletin 7, 3-4, 1965.

Tang, A. Economic Development in the Southern Piedmont 1860-1950, Univ. of North Carolina Press, Chapel Hill, 1958.

Toogood, J.A., C.F. Bentley, G.R. Webster, and A.W. Moore Grey Wooded Soils and their Management, Bull. S-M-1 (No. 2), Faculty of Agriculture, Univ. of Alberta, Sept. 1962.

Tweetan, L.G. Principles of Area Growth, Unpub. lecture presented to Conference on Social and Economic Development in Western Canada, Banff, Alberta, 1968.

Vanderhill, B.G. "The Farming Frontier of Western Canada 1950-1960". Journal of Geography, 61(1962), pp. 13-20.

Vanderhill, B.G. "Observations in the Pioneer Fringe of Western Canada". The Journal of Geography, Vol. LVII, No. 9, Dec. 1958, pp. 431-441.

Vanderhill, B.G. "The Direction of Settlement in the Prairie Provinces of Canada". The Journal of Geography, 58, 1959, p. 327.

Waddell, W.H. Survey Book No. 10106; Oct-Nov., 1908, Alberta, Dept. of Highways, Edmonton.

Williams, F. Reasoning with Statistics, Holt, Rinehart and Winston, Inc., New York, 1968.

Wood, V.W. Public Land Policy for Alberta, Unpub. Ph.D. thesis, Univ. of Minnesota, 1953.

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APPENDIX I

Matrix for the Lac La Biche Study Area.

Correlation Coefficients Sample size = 97

	1	2	3	4	5	6	7	8	9	10	11	12	13
2	-0.225												
3	0.174	-0.798											
4	-0.287	0.012	-0.115										
5	0.095	0.000	0.207	0.159									
6	0.646	-0.050	0.107	-0.310	0.115								
7	0.327	-0.042	0.065	-0.189	0.013	0.118							
8	0.768	-0.130	0.255	-0.413	0.123	0.786	0.329						
9	0.383	-0.006	0.026	-0.171	0.022	0.866	-0.105	0.444					
10	0.740	-0.099	0.414	-0.363	0.118	0.862	0.273	0.828	0.634				
11	0.468	-0.238	0.302	-0.230	0.052	0.336	0.306	0.468	0.175	0.508			
12	0.700	-0.342	0.424	-0.332	0.156	0.749	0.169	0.795	0.519	0.713	0.575		
13	0.370	0.344	-0.211	-0.290	0.014	0.501	0.077	0.481	0.351	0.474	0.040	0.339	
14	0.507	0.211	-0.105	-0.342	0.120	0.694	0.341	0.734	0.425	0.649	0.184	0.545	0.570

APPENDIX I

Matrix for Cash Grain Area.

Correlation Coefficients   Sample size = 41

	1	2	3	4	5	6	7	8	9	10	11	12	13
2	-0.467												
3	0.289	-0.668											
4	-0.049	0.089	-0.272										
5	0.123	0.292	0.052	0.054									
6	0.416	-0.223	0.384	-0.400	0.190								
7	0.091	0.117	-0.084	-0.157	-0.028								
8	0.523	-0.255	0.605	-0.483	0.211	0.663	0.083						
9	0.194	-0.137	0.145	-0.239	0.064	0.869	-0.026	0.297					
10	0.506	-0.312	0.485	-0.320	0.304	0.855	-0.102	0.734	0.646				
11	-0.121	0.094	-0.192	-0.072	0.079	-0.108	0.041	-0.285	-0.013	-0.153			
12	0.533	-0.448	0.683	-0.336	0.155	0.681	-0.120	0.746	0.402	0.742	-0.212		
13	0.260	0.159	0.087	-0.264	0.481	0.431	0.014	0.531	0.147	0.552	-0.022	0.319	
14	0.250	0.032	0.273	-0.558	0.382	0.654	0.101	0.700	0.364	0.578	-0.080	0.447	0.617

APPENDIX I

Matrix for Mixed Farming Area.

Correlation Coefficients Sample size = 29

	1	2	3	4	5	6	7	8	9	10	11	12	13
2	-0.047												
3	0.117	-0.878											
4	-0.213	0.094	-0.003										
5	0.135	0.411	-0.257	0.086									
6	0.809	-0.103	0.177	-0.286	0.113								
7	0.383	-0.118	0.112	-0.208	-0.084	0.173							
8	0.895	-0.070	0.145	-0.377	0.070	0.881	0.393						
9	0.522	-0.102	0.171	-0.075	0.042	0.861	-0.181	0.554					
10	0.892	-0.194	0.281	-0.299	0.104	0.868	0.406	0.406	0.626				
11	-0.521	0.385	-0.405	-0.103	0.138	-0.346	-0.114	-0.383	-0.268	-0.400			
12	0.735	-0.224	0.295	-0.252	0.122	0.897	0.162	0.824	0.721	0.765	-0.503		
13	0.544	0.354	-0.326	-0.301	0.011	0.642	0.144	0.566	0.549	0.477	-0.210	0.569	
14	0.686	0.028	0.087	-0.208	0.223	0.768	0.441	0.818	0.478	0.722	-0.235	0.723	0.517

APPENDIX I

Matrix for Pioneer Area.

Correlation Coefficients Sample size = 27

	1	2	3	4	5	6	7	8	9	10	11	12	13
2	0.402												
3	-0.129	-0.206											
4	-0.077	-0.316	-0.061										
5	0.216	-0.299	0.403	0.296									
6	0.608	0.464	-0.249	0.116	0.191								
7	0.025	-0.228	0.242	0.003	0.090	-0.360							
8	0.663	0.378	-0.137	0.028	0.378	0.732	-0.247						
9	0.488	0.520	-0.181	0.052	0.035	0.894	-0.251	0.478					
10	0.415	0.297	-0.304	0.074	0.179	0.858	-0.356	0.718	0.672				
11	0.203	-0.096	-0.082	0.121	-0.049	-0.025	0.016	0.077	-0.189	0.076			
12	0.685	0.235	-0.001	0.075	0.404	0.565	-0.015	0.679	0.318	0.428	-0.063		
13	0.410	0.833	-0.258	-0.262	-0.393	0.351	-0.124	0.354	0.381	0.305	0.070	0.277	
14	0.604	0.609	-0.375	-0.010	-0.134	0.537	-0.108	0.507	0.396	0.451	0.153	0.620	0.701

APPENDIX II: QUESTIONNAIRE

Section I Person in Charge

1. Name: ____________________

   Address: ____________________

2. How long have you been a farm operator? ________ Years

3. Were you raised on a farm? Yes ________ No ________

4. How old were you in 1967?

   Under 25 ______ 25-29 ________ 30-34 ______ 35-39 ____

   40-44 ________ 45-49 ________ 50-54 ______ 55-59 ____

   60-64 ________ 65 or Over __________

5. How many children do you have? __________

   Please list in order of age.

Name	Sex	Year Born	Years of School	Occupation	Residence

6. How many of your family besides yourself work on the farm? ______

Section II Land

7. Total amount of land worked ________ acres

   Number of acres cultivated ________ acres

   Acreage owned ________ acres

   Acreage rented or leased ________ acres

   Acreage arable but not developed ________ acres

8. Legal description of land.

<u>Quar</u>.	<u>Sect</u>.	<u>Twp</u>.	<u>Rge</u>.	<u>Mer</u>.	<u>Tenure</u>

9. Are there any difficulties connected with this farm?

Sloughs or Lakes	Yes ______	No ______
Muskeg	Yes ______	No ______
Rows of bush piled	Yes ______	No ______
Stone mounds	Yes ______	No ______
Other	Yes ______	No ______

10. Have any sloughs or low lying marshy areas been drained for farming?

Yes ______ Acres drained ______ No ______

11. Is there any tendency to flooding? Yes ______ No ______

12. What types of soil do you have on your farm?

13. How would you describe the degree of stoniness?

Low ______ Average ______ Extreme ______

14. How would you describe the hilliness on your farm?

Flat ______ Rolling ______ Hilly ______

If it is rolling or hilly, does this affect your farming techniques and/or power units?

15. What is the land classification?

Section III Crops and Livestock

16. What grains and other crops did you grow in 1967?

	(a) Acres combined or threshed	(b) How much harvested	(c) What percentage sold	(d) Grade received
	acres	bushels		
Wheat -	____	____	____	____
Oats -	____	____	____	____
Barley -	____	____	____	____
Rye -	____	____	____	____
Rape -	____	____	____	____
Other -	____	____	____	____

Was the straw baled? Yes ______ No ______

For sale? Yes ______ No ______

17. What forage crops were grown in 1967?

	(a) Acres harvested	(b) Tons harvested	(c) Tons sold
Alfalfa -	____	____	____
Clover -	____	____	____
Hay -	____	____	____
Greenfeed -	____	____	____
Other -	____	____	____

18. Have you been satisfied with the yields obtained from these crops?

One year in 10 __________ Four years in 10 _________

Six years in 10 _________ Nine years in 10 _________

19. Do you use chemical fertilizers? Yes _______ No ________

If NO why not?

20. Have crop yields or crop harvesting ever been affected in any year by late spring or early fall frosts?

Late spring __________ years out of 10

Early fall __________ years out of 10

21. Where do you sell these crops? ______________ Distance _________

22. Where do you buy the seed? __________________ Distance _________

23. Taking one particular field on your farm, describe the crop rotation you would use.

24. Did you keep livestock and/or poultry in 1967? Yes _____ No ____

	Number	Approx. Value
Cattle and Calves	____	____
Pigs and Hogs	____	____
Horses	____	____
Sheep	____	____
Poultry	____	____

25. Where are the livestock sold? ___________ Distance __________

26. Were the livestock your own, or were you buying them through a Feeders Association? Yes ________ No __________

27. Many farmers have entered into contracts with dealers, processors and others for the production and marketing of farm products. Many agencies and persons consider such contracts to be among the newest and most important farming developments in recent years. Do you have any such contracts? Yes _____ No ______

If YES, specify

28. Taking your own farm and type of soil as examples, what size of holding do you consider to be necessary to make farming a paying proposition?

29. What is your estimate of the present market value of the land and buildings on this farm? $ ___________

<u>Section IV Farm Equipment</u>

30. Machinery on farm?

	Number				
Wheel tractors	_____	N.P.	______	Fuel	_____
Crawler tractors	_____	Sort	______		_____
Cultivators	_____	Width	______		
Discs	_____	One way	_______	Two way	_______
Seeders	_____	Ordinary	______	Press drill	____
Balers	_____	Pull type	_____	Self drop	______

	Number		
Forage harvesters	____		
Tractor mowers	____	P.T.O. ______	
Swathers	____	Pull type _____	Self drop _____
Grain Combines	____	Pull type _____	Self drop _____
		Capacity in Bushels __________	
Rakes	_____	Side Delivery ____	Other _______
Trucks	_____	Size ______	Year _______
Cars	_____	Year ________	

31. Where do you buy your machinery? ________________ Distance ______

32. Where do you buy your parts? _______________ Distance ___________

33. Do you do any custom or contract work? Yes _______ No __________

If YES, what type?

Section V, Income

34. Try to estimate what proportion of your farm revenue is obtained from the sale of the following products:

Grains	_____%	Oil seeds	______%	Fodder crops	_____%
Livestock	_____%	Livestock Products	______%	Other	_____%

35. In which of the following categories did your income for 1967 fall?

$0-2,000 ___ $2-4,000 ___ $4-6,000 ___ $6-8,000 ____

$8-10,000 ____ $10-12,000 ___ $12-15,000 ___ Over $15,000 ___

How much was obtained from crop insurance? __________

How much was obtained from welfare? ________________

Was there any other revenue? _____________ From what source? ___

____

36. Is it necessary to have another job to make ends meet on your size of farm and type of soil?

(a) In the initial homesteading period? Yes _____ No _____

(b) Once clearing is complete? Yes _____ No _____

37. What wage and salary payments were made to the following in 1967?

(a) Yourself (the operator) $__________

(b) Hired help $__________

(c) Other family members $__________

38. What is your opinion of farming?

39. What training is necessary for a farmer?

40. What is your own training or education?

Any additional training?

41. Do you have any future plans or ideas about farming?